The Electrical Industry's Weekly Magazine July 13, 1959

Electrical World

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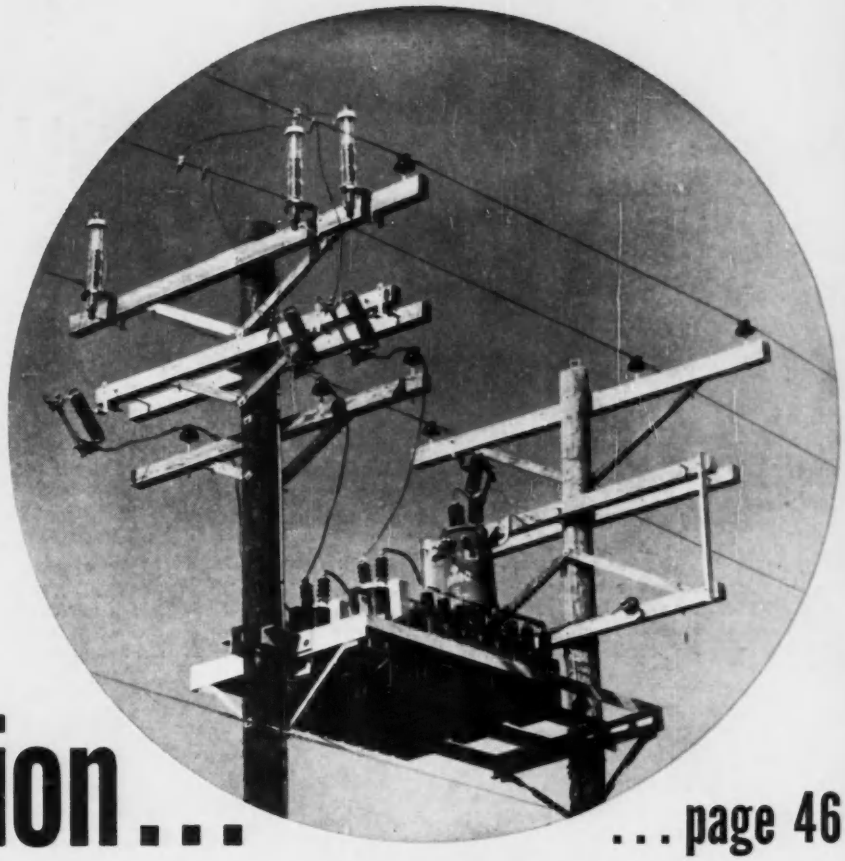
Reduced BIL Insulates 20-Kv Distribution...



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Commonwealth Edison System Goes to Automatic Dispatch...

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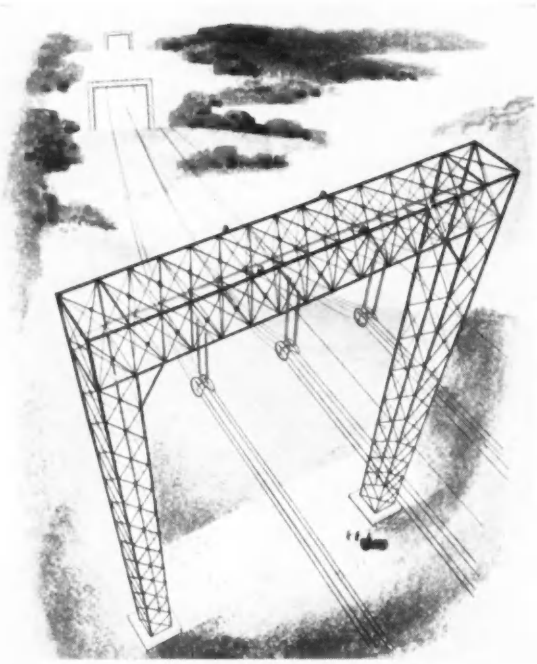
Utility Rate Increases La... at Mid-Year..... page 7...

STEVENS RICE GS W
UNIVERSITY MICROFILMS IN
313 N 1 ST
ANN ARBOR MICH

CLIMAXING 3 YEARS OF PLANNING: General Electric's Dr. P. A. Abetti, Project Manager, breaks ground for first Project EHV tower. Ceremonies were held May 27, 1959 at northern terminus of line, Pittsfield, Mass. Watching are (from left) J. W. Seaman and L. Wetherill, G.E.; L. R. Gaty, Philadelphia Electric Co.; R. M. Wood and H. E. Marx, Stone & Webster Engineering Corp.; and J. H. Foote, Commonwealth Associates.*



PROJECT EHV CONSTRUCTION UNDERWAY!

Construction crews and earth movers are now busy at the site of General Electric's experimental EHV power line. By year's end, the northern substation and three portal towers will be erected. Next spring, this section will be energized for tests in 400- to 550-KV range. Upon completion of the entire line in 1961, Project EHV will be 4½ miles long, employ 18 towers, and operate at 750-KV maximum. Pointing the way to America's power-filled future, Project EHV is an unusual research tool—helping assure, in advance, that EHV apparatus, technology and experience will be ready when electric utilities design and build the super-voltage lines of the future. For more information, contact your local G-E Apparatus Sales Office. 301-408

*Also cooperating on Project EHV: Aluminum Company of America; American Bridge Division, United States Steel; Anchor Metals; Brewer-Titchener Corp.; Petersen Engineering Co.; Rilco Laminated Products; Western Massachusetts Electric Co.; and Weyerhaeuser Timber Co.

MORE POWER TO AMERICA

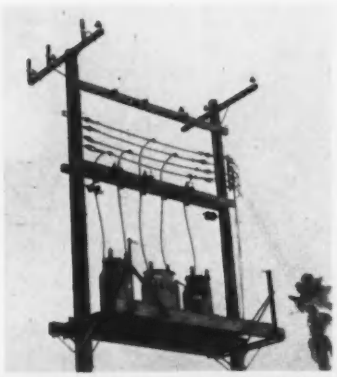
GENERAL ELECTRIC

Electrical World

Vol. 152, No. 2 JULY 13, 1959

Published for 85 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

In This Week's Issue



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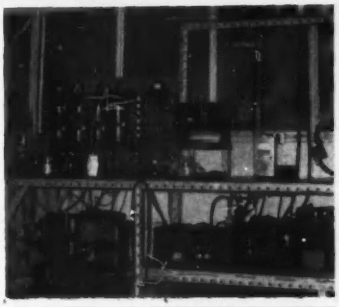

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Giant Systems Turns to Automatic Dispatch

Commonwealth Ed's new $700,000 unit has incremental computing of 37 machines with 4,634 Mw capability.....p 40

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T. G. Woods, Jr., Arizona Public Service

Arizona utility reports on six years experience on 300 miles of line in remote areas.....p 46

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What is Optimum Right-of-Way Width?

T. J. Allen, Georgia Power Co

Rights-of-way larger than those in current use can sometimes be economically justified.....p 53

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In the Industry

Research and Organization

The growing value of direct utility research was given special recognition recently when Pacific Power & Light Co decided to form a separate research department. The company, eyeing the demands of today's ever more complex technologies, feels its research can be best fostered, encouraged, and coordinated if kept entirely separate from day-to-day engineering activities.

Actually, in Pacific Power's case, the new department, at least at first, simply will regroup research personnel already active in a number of fields. Industrial electro-technology, future power sources and methods, industrial raw materials, and fish conservation are among the areas getting sharp attention right now.

Pacific Power is a research-minded utility. Chairman Paul McKee put his finger on the philosophy behind the reorganization of the research staff when he cited the "virtually unlimited" areas of research potentially open to electric utilities. If he is right, and we think he is, optimum coordination by skilled research administration is a must. The new department at Pacific Power & Light can supply this type of guidance.

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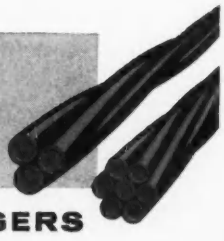
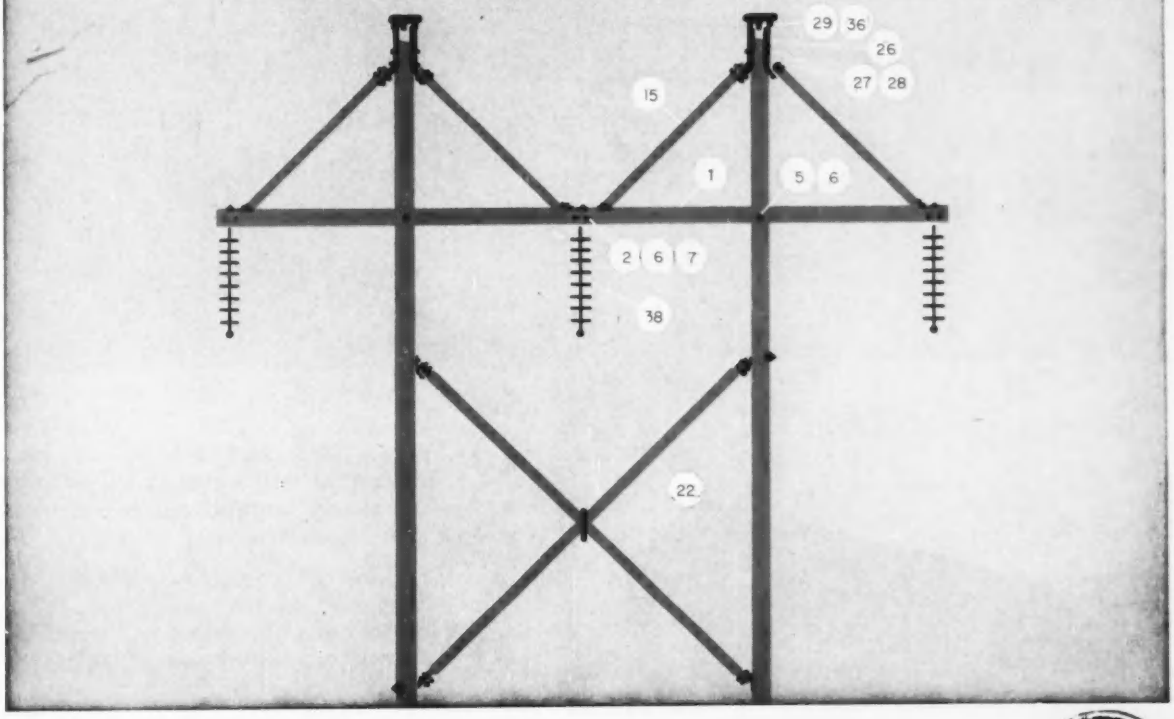


FOR GUYS AND MESSENGERS

TANGENT W/BRACES NO. 702

H-FRAME STRUCTURE, DOUBLE PLANK CROSSARMS WITH METAL SPACERS, POLE TOP STATIC WIRE SUPPORTS, AND WOOD CROSS BRACES DESIGNED FOR 69 TO 154 KV CONSTRUCTION

DRG. REF. #	QUANTITY	DESCRIPTION	DRG. REF. #	QUANTITY	DESCRIPTION
792	2	Pole	15	4	Vee brace 3⅜" x 4⅜" cross section
1	2	Crossarm	22	1 set	Cross brace w/fittings, clamp, ⅞" pole bolts and curved washers
2	3	Steel spacer fitting w/mounting bolts	26	2	Static wire support
5	2	Stud bolt ⅞" w/washer nuts	27	4	Machine bolt ¾"
6	8	MF locknut ⅞"	28	4	MF locknut ¾"
7	1	Bent stud bolt ⅞" x 8" w/2 sq. nuts	29	2	Clevis
			36	2	Suspension clamp for static wire
7	2	Bent bolt ⅞" x 5½" w/sq. nut	38	As required	Suspension insulators and fittings



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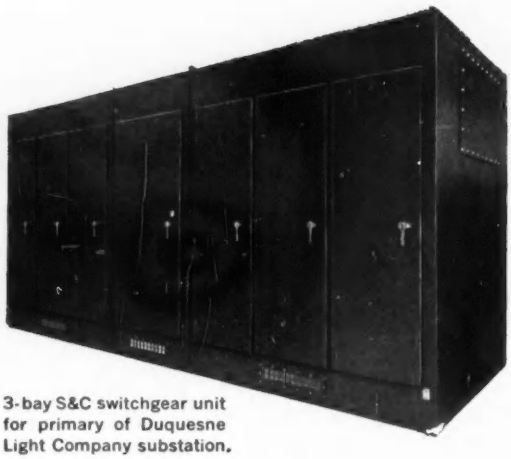
Question:

How does Duquesne Light Company approach the problem of locating 23 kv substations in closely built-up residential areas?

Answer:

By using completely metalclad substations with S&C metal enclosed fused load interrupter switchgear developed cooperatively by Duquesne and S&C; and by putting the 23 kv and 4 kv circuits underground (as shown at right).



3-bay S&C switchgear unit for primary of Duquesne Light Company substation.

Q: Why is S&C metal enclosed fused load interrupter switchgear suited to substations in closely built-up residential, commercial, and industrial areas?

A: Because it gives safety to the public, attractive appearance, and compactness.

Q: How is attractive appearance achieved?

A: By eliminating steel structures or wood poles, exposed switches, potheads, fuses, and lightning arresters. This gear is also streamlined so that a Duquesne substation offers a low silhouette which fits unobtrusively into its surroundings.

S&C

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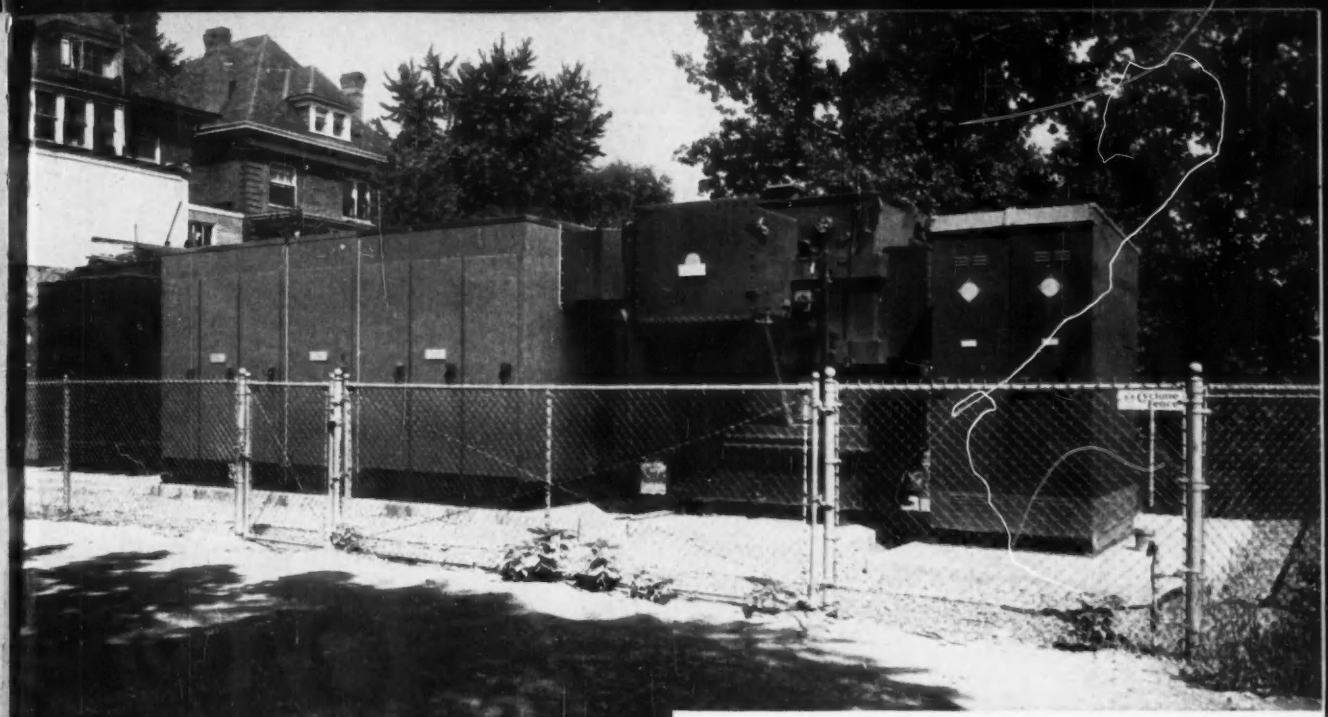
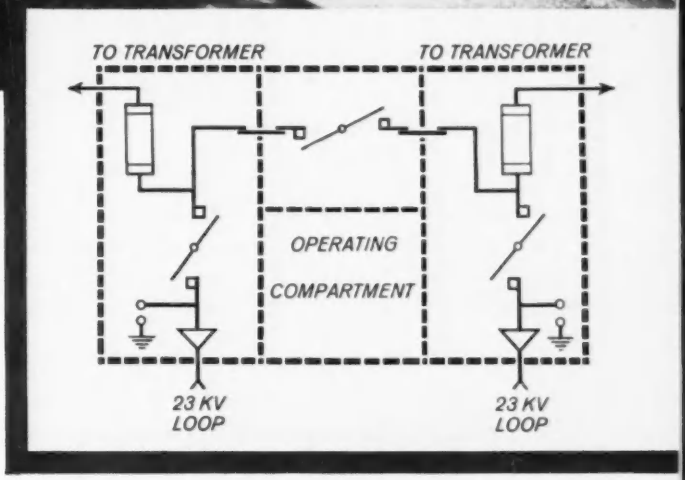




Q. What does compactness mean to Duquesne?

A. Large sites are not required for these substations, thus the difficulty of site procurement, not to mention the cost, is significantly reduced.

Q. Why was S&C chosen to participate with Duquesne in this cooperative program to develop a completely metal-enclosed 23 kv substation?

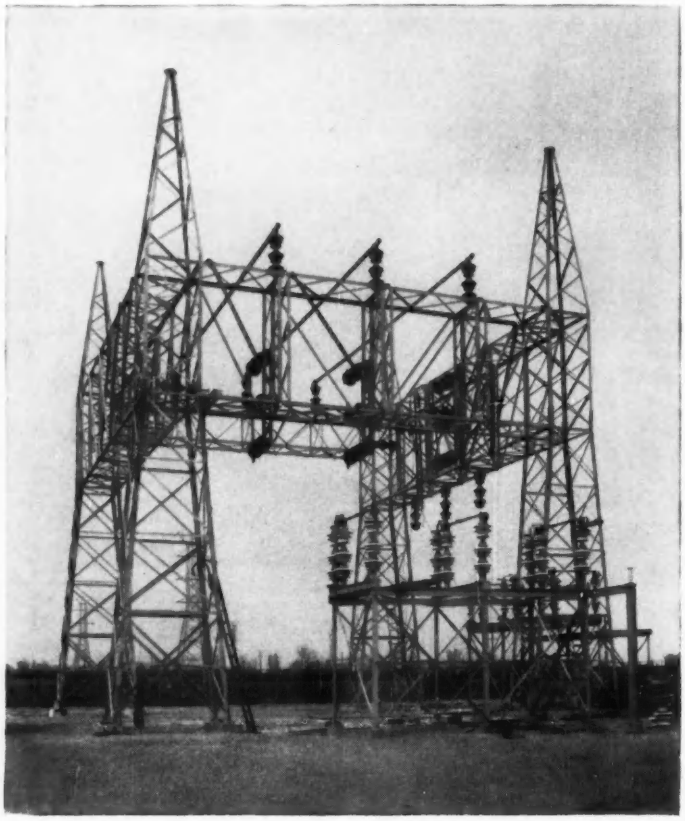
A. Because S&C had developed compact load interrupters for arc-free switching, as well as a correspondingly compact power fuse with controlled exhaust—both ideally suitable for metalcladding.

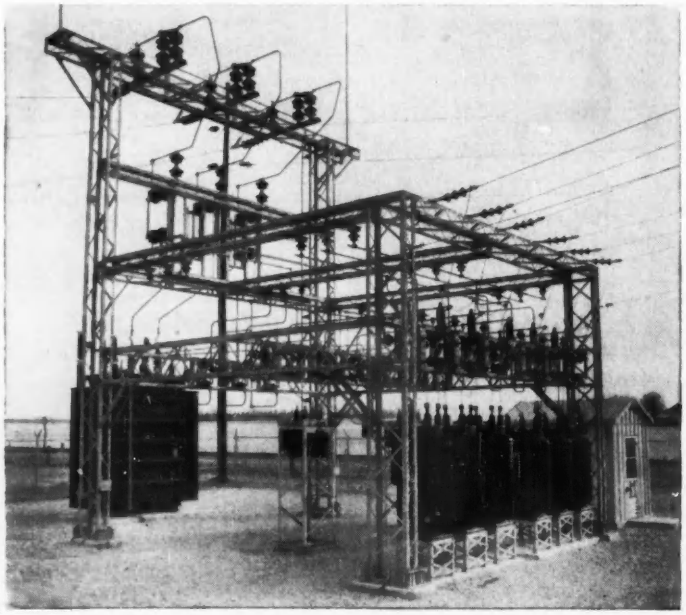
Q. How can utilities learn more about the use of S&C metal-enclosed fused load interrupter switchgear?

A. Write for additional information to S&C Electric Company, 4421 Ravenswood Avenue, Chicago 40, Illinois. In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 18, Ont.

S&C METALCLAD FUSED LOAD INTERRUPTER SWITCHGEAR

Commonwealth Edison's new Blue Island substation is an important element in their main transmission system serving the Chicago area. The photo shows the second section under construction which uses about 20 tons of USS Structural Steel. The fabricator was the Charles E. Schuler Engineering Co., Newark, Ohio, and the material was supplied by Royal Electric Mfg. Company, Chicago, Illinois.





This smaller substation, also fabricated by Schuler, is a Modified Erection, prefabricated type using about eight tons of USS Structural Steel. It is owned by the Central Illinois Light Co., Peoria, Illinois. The substation is located at Henry, Illinois, and serves a sixty square mile area of about 6,000 people, including the town of Henry and a large industrial plant.

For large or small substations, you can't beat STEEL for economy!

Structural Steel saves time and money for both large and small substations. It offers strength, fast erection and long life. It can be prefabricated to any desired extent, and shipped knocked down or factory assembled.

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The Electrical Week

LATE NEWS ▶ **Florida P&L invites foreign and domestic firms to submit bids** for two 200-Mw steam turbogenerators. Brown-Boveri and English Electric are asked along with GE and Westinghouse. FP&L president R. H. Fite, in a telephone interview with Electrical World, said he couldn't understand what all the fuss (about inviting bids from foreign firms) was about: "After all, we buy steel from Italy and oil from Venezuela." A contract award is expected in about a month.

Bonneville will make feasibility study of Northwest-California tie, it was decided by 60-man group representing utility and government interests. Dec. 31 is set as earliest date report can be ready.

FPC grants two-year preliminary permit to Blue Ridge Electric Membership Corp to study feasibility of building 1,400-kw hydro plant at Army Engineers' Wilkesboro Dam on Yadkin River, N. C. Co-op would use power entirely for its own customers . . . FPC belatedly drops preliminary permit held by Klickitat County PUD No. 1 for John Day project. Corps of Engineers will do the job.

EEI Accident Prevention Committee adopts mouth-to-mouth respiration method. Committee passes resolution recommending it as preferred.

Pennsylvania Transformer announces new department for manufacture of secondary unit substations and switchgear. New departments will be located adjacent to PT's transformer plant in Canonsburg, Pa.

Management changes . . . Florida Power elects three new vp's: W. B. Shenk, sales; A. V. Benson and W. M. Pickett, in charge of divisions. At the same time, J. S. Gracy takes on responsibility of over-all division operations . . . At Leeds & Northrup: A. R. Cary becomes chairman, D. H. Schultz is new senior vp, and G. E. Beggs, Jr becomes executive vp . . . Burns & Roe elects Alexander Matiuk vp.

WEEKLY POWER OUTPUT—UP 17.8% (Week ending July 4), Kwhr 13,200,000,000

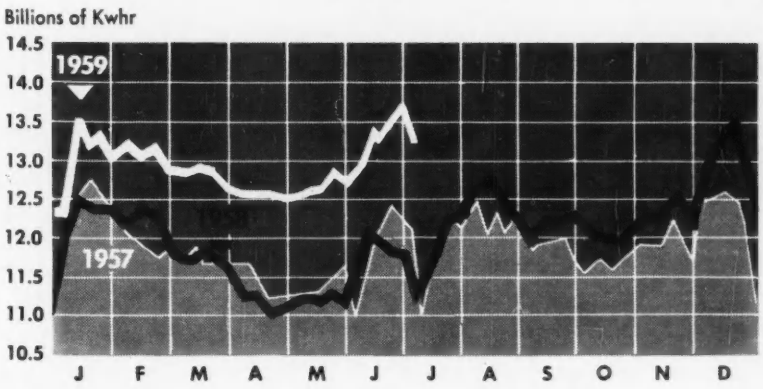


Figure above is estimated
Regional figures not available

Per Cent Change From Previous Year

	June 20	June 27	July 4
Total U. S.	+11.6	+16.9	.....
New Eng.	+10.8	+11.4	.....
Mid Atlantic	+ 9.8	+16.4	.....
Cent. Ind.	+16.7	+21.5	.....
West Cent.	+15.2	+21.4	.....
Southeast	+ 5.3	+12.8	.....
South Cent.	+ 7.7	+16.4	.....
Rocky Mount	+14.5	+15.3	.....
Pacific			
NW	+18.5	+18.5	.....
SW	+14.2	+15.9	.....

Seasonally Adjusted Index 270.3
Week ago 258.6 Year Ago 231.2

Source: Edison Electric Institute

Preview of this Issue

EVENTS ▸ **An automatic dispatch system now controls 92% of production** at ten Commonwealth Edison plants. The $700,000 GE installation ties in 37 units for most economical generation **(p 40)** . . . Two AEC contracts may speed the day of boiling water power plants using nuclear superheat **(p 41)** . . . Output hits a new high of 13,749,000,000 kwhr for week ending June 27 **(p 42)** . . . Strike at Public Service of Indiana surprised management because union had signed memo of agreement on 4% boost **(p 43)** . . . Duke Power signs 25 towns on contract giving percent of gross in lieu of license tax **(p 43).**

ENGINEERING ▸ **The liquid carbon dioxide installation** at Con Ed's Astoria station speeds turbine purging and saves on plant space **(p 45)** . . . Lower BIL insulates 20-kv distribution at Arizona PS **(p 46)** . . . Consumers Power finds that load cycle testing at 100C is adequate for evaluating connector ability to perform its function **(p 48)** . . . To detect critical ice build-up BPA uses wire sphere, strain gauge load cell tested for remote signalling **(p 52)** . . . Rights-of-way wider than those in common use can sometimes be economically justified **(p 53).**

PROCUREMENT & PRODUCTS ▸ **Resentment against inflation is a growing political force** . . . Many purchasing agents shying away from foreign buying, according to

Politics and Public Power

CONFUSION ON THE HOUSE FLOOR

The political confusion which often surrounds the electric power industry—or rather special segments of it—can be confounding indeed. This was demonstrated on the floor of the House last month.

The House was debating HR-3, a bill aimed at clarifying the federal doctrine of preemption, i.e., of federal legislation cancelling state laws on the same subject. The bill, which the House passed, is an attempt to curb the effects of several recent Supreme Court decisions. The forces for and against it seemed to be drawn very much along the line of the states rights-vs-strong central government controversy, a running battle as old as the Republic itself.

The curious new wrinkle this time, however, came in the form of a letter to selected Congressmen from Clyde T. Ellis, general manager of National Rural Electric Cooperative Assn. Rep Ancher Nelsen (R-Minn.) read to the House a copy of the letter, given him by a Congressman who received it.

Ellis maintained that HR-3 should be rejected because, "We feel that passage of legislation embodied in HR-3 would seriously hamper the operations of the Federal Power Commission and those federal agencies which over the years have time and time again been delegated the authority and responsibility by the courts and the Congress to have control over navigable waterways and streams, water rights, and use of water for irrigation, navigation power development, etc.

"In addition, passage of such legislation would throw into chaos the interpretation of the federal property clause of the Constitution, Section 3, clause 2, under which all the federal power projects have operated . . ."

recent survey by National Assn of Purchasing Agents . . . Decentralization of purchasing departments is a trend in all industries, McGraw-Hill study shows, with few implications for utilities **(p 60).**

MANUFACTURERS ▶ **Welded carbon steel tubing is introduced** by Babcock & Wilcox . . . Allis-Chalmers uses round-the-clock preheat in fabricating reversible pump-turbines . . . Alcoa builds another aluminum tower . . . Lightweight capacitor is developed by GE **(p 64).**

NEW EQUIPMENT ▶ **Westinghouse Electric unveils current transformer for indoor use** in low-voltage metering . . . A new line of luminaires is now available from GE . . . Husted Electrical Mfg reports service take-off for Triplex or parallel wire span will take No. 6W to 2/0 ACSR inclusive in either groove **(p 70).**

MANAGEMENT ▶ **First-half rate increases were off the pace of 1958,** but a heavy slate of pending applications hints that electric rate hikes may reach $100 million before the year is out. Utilities' costs keep up their inexorable rise, but many commissions offer stiffer resistance. There's bad news from Maine, New York, and Michigan, but some encouragement from Maryland **(p 79).**

What Nelsen wanted to know was whether Ellis' analysis was correct, whether HR-3 would so affect rural electric co-ops. The answers were not long in coming. With one exception, they constituted an emphatic "no".

They came from such strong REA supporters as Reps Willis (D-La.), Matthews (D-Fla.), Chelf (D-Ky.) and Dorn (D-S. C.). The gist of their remarks was that HR-3 would in no way be harmful to the co-ops. Said Chelf: ". . . No, I cannot conceive of any section of this bill that would affect labor adversely—civil rights, REA, railroads, their employees, or anybody else."

Or Matthews: ". . . I can assure him (Nelsen) that this letter does not represent the philosophy of the wonderful REA's in the Eighth District of Florida. I would go so far as to say that 99 and 99/100 of the members in the Eighth District . . . are behind HR-3."

According to the Congressional Record, Rep Pilcher (D-Ga.) reported "I have just talked to Mr. Walter Harrison, national president of the Rural Electric Cooperative Assn, and he says he is 100% in favor of the bill."

Ellis, in a subsequent letter to Electrical World, clarified his position. He said: "My letter intended to convey our concern over the fact that the bill failed to exclude the Rural Electrification Act, the federal river development laws, and the FPC regulatory laws. It was written in the light of proposed amendments to the bill to exclude matters affecting rural electrification. One such amendment was offered on the House floor . . . An amendment to the bill to exclude laws affecting the rural electrification program . . . would be in keeping with our attitude . . . Unfortunately, an exemption such as this was not included in the bill as presented to the House."

Executive Reader

Any investor who purchased a diversified portfolio of well-selected stocks and held them has fared very well. For this, we give credit to the fundamental soundness of the utility business itself, the hightype, able, and aggressive management which most companies enjoy, and the fairness of the regulatory bodies to which these companies are responsible. **Harold H. Young, Public Utilities Fortnightly, July 2, 1959.**

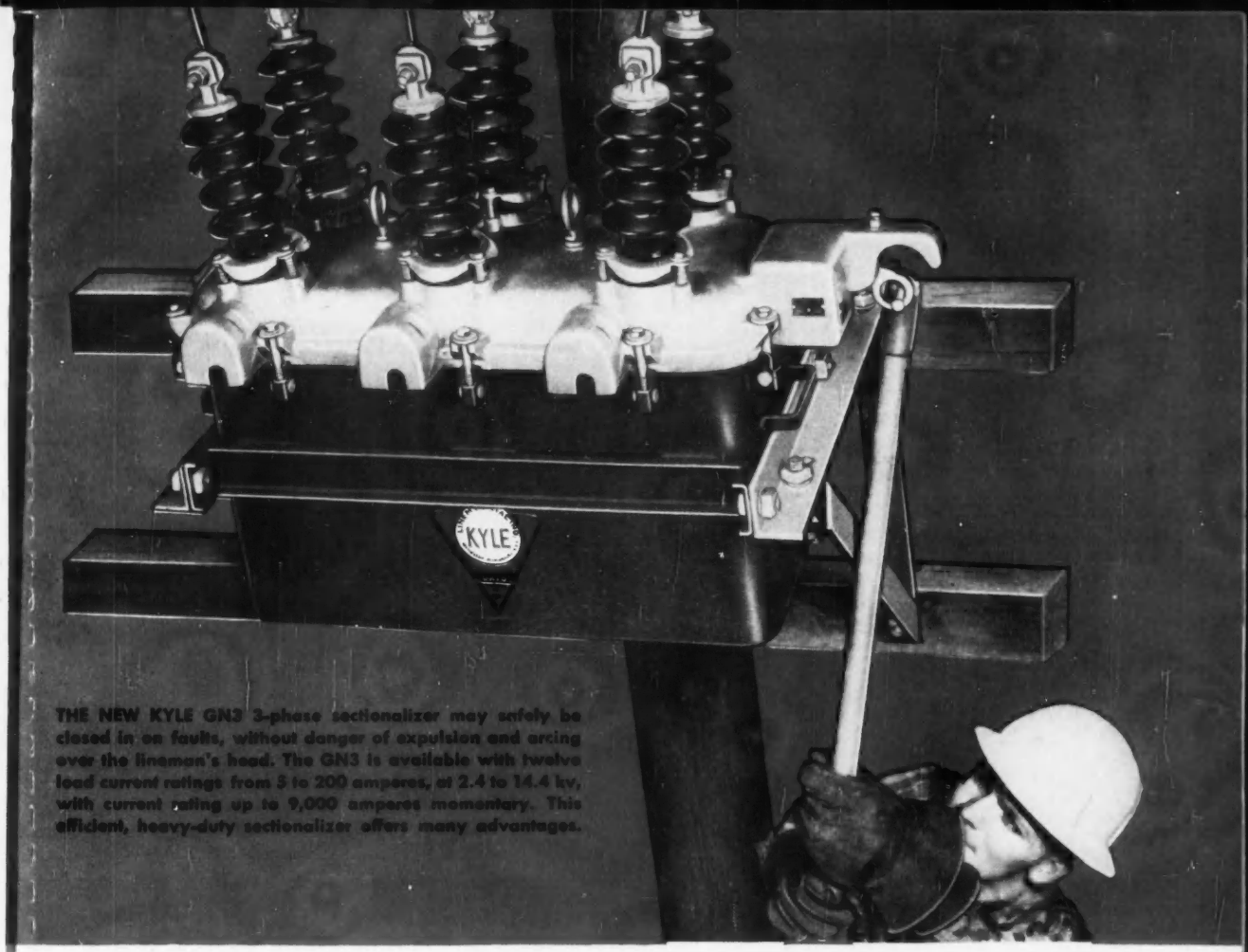
If you have a transaction that may affect taxes, be sure to contact your tax department for possible savings. A list of 39 types of such items are shown that could be affected. **William H. Harrison, Edison Electric Institute Bulletin, May 1959.**

Average American home can be heated and cooled electrically for $8.44 per month in the South to $14.60 in the North, provided it is properly insulated and designed. Costs are based on 1,200 sq ft of living space and are actual average one-year costs of heating and cooling of 70 of 116 houses included in a national test program. **Owens-Corning Fiberglas Corp, Toledo, Ohio.**

Utilities have nine areas of cooperation in their association with major and small electrical appliance dealers. Among these are: Acquainting dealers with new products; amortizing adequate home wiring as a capital expense; financing small appliances through the customer's bill; increasing promotion of television; helping dealers maintain service departments; and sending representatives to NARDA schools and institutes. **Mort Farr, NARDA board chairman, PUAA Third Region meeting, Lexington, Ky.**

Annual increase of 5% is the current trend in construction costs, with little prospect of leveling off. Primary impetus for increased costs comes largely from the labor sector. Heavy construction costs have climbed 67% since 1949, while material prices have moved up 53%. **Engineering News-Record.**

Electric heating is the obvious first step that utilities in all parts of the country can take to balance off the growing summer demands of air conditioning. Buildings in northern climes require about the same amount of cooling capacity as identical buildings in the South. While the equipment would operate fewer hours, in New England as compared with Atlanta or Little Rock, the electrical demand and the need for compensating winter load is just as great. **Robert M. Wood, Ebasco Services, New England Gas Assn Residential Workshop, Lenox, Mass., May 27, 1959.**



THE NEW KYLE GN3 3-phase sectionalizer may safely be closed in on faults, without danger of expulsion and arcing over the lineman's head. The GN3 is available with twelve load current ratings from 5 to 200 amperes, at 2.4 to 14.4 kv, with current rating up to 9,000 amperes momentary. This efficient, heavy-duty sectionalizer offers many advantages.

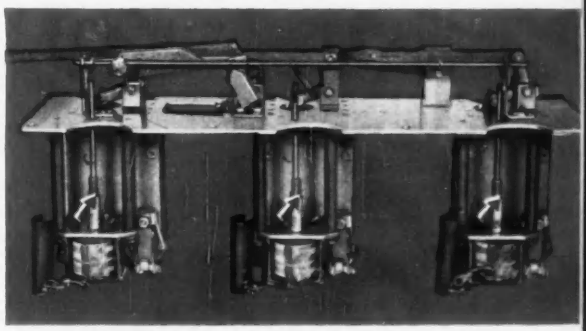
L-M Announces New Kyle Type GN3 World's First 3-Phase Sectionalizer

The new Kyle GN3 cuts service trips and saves engineering time because it simplifies coordination problems. It is safe for linemen to operate, when closing in on a fault. The GN3 is the first 3-phase sectionalizer on the market.

Kyle sectionalizers operate, and lock out, while the back-up recloser is open. The GN3 incorporates single-phase counting with positive internal interphase linkage for 3-phase lockout in a single tank. The GN3 may be set to lock out after one, two, or three operations of the recloser. This adjustment is very simple; it may be made in the field if desired.

Get Complete Information

Discuss the use of sectionalizers instead of fuses with your associates. The GN3 can offer some marked savings and operating advantages. Ask the L-M Field Engineer for complete information, or write for bulletin. Line Material Industries, Milwaukee 1, Wis. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.



COMPLETE GN3 MECHANISM lifted out of the tank. To set to lock out after one, two, or three operations of the backup recloser, simply re-index each trip piston extension of the sectionalizer (arrows). With interphase linkage inside the tank, there is no possibility of misalignment or operating difficulty because of corrosion or icing.

LINE MATERIAL® Industries Kyle® Switchgear

McGRAW-EDISON COMPANY

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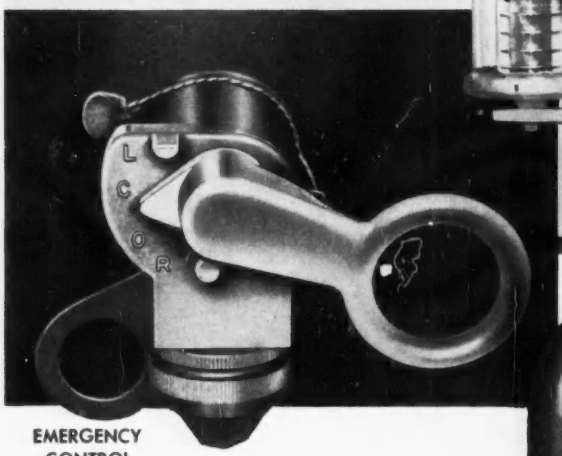
DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS
POWER SWITCHING EQUIPMENT • PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING
LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT

McGRAW EDISON

THIS NEW BREAKER is internally mounted on the core and coil frame, providing easy accessibility through the handhole.

THE NEW L-M SECONDARY BREAKER, with trip-free control handle and signal light in a single unit, is completely operable with hook stick.



EMERGENCY CONTROL

FOUR POSITIONS ARE PROVIDED ON THE CONTROL HANDLE:

Position L—Light reset and/or test. This resets the light mechanism and simultaneously tests the bulb. Handle returns to Position "C" when the hook stick is removed. Thus the bulb and entire light circuit can be tested without risk of inadvertently opening the breaker and disconnecting the load.

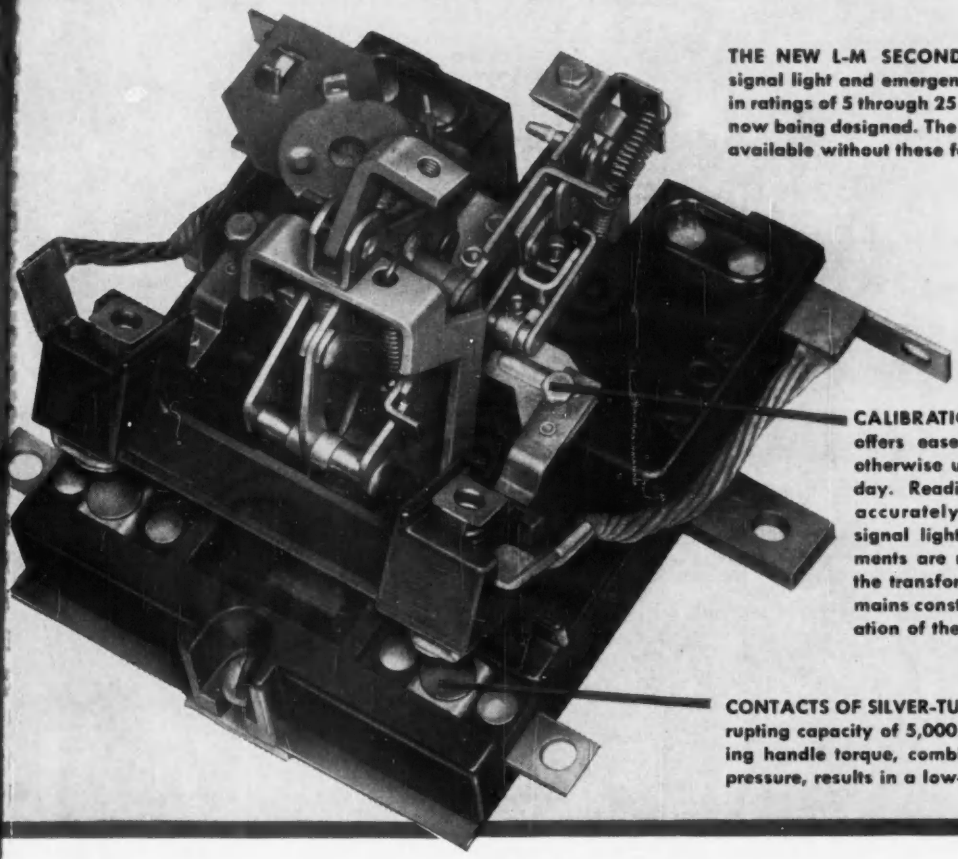
Position C—Close breaker. This is the normal operating position.

Position O—Open breaker. To open breaker manually, move the handle to Position "O."

Position R—Reset breaker. The breaker is manually reset by moving the control handle to Position "R." This motion precedes the closing operation to Position "C."

Emergency Control Handle—Emergency overload control can be accomplished by means of the emergency control handle. This handle is also hook-stick operated.

Signal Light—The brilliant glass-prism signal light is visible from the ground to slightly above horizontal.



THE NEW L-M SECONDARY BREAKER, with signal light and emergency control, is available in ratings of 5 through 25 kva, with larger ratings now being designed. The 3 and 5 kva ratings are available without these features.

CALIBRATION—This secondary breaker offers ease and accuracy of calibration otherwise unobtainable on the market today. Readily accessible adjusting screws accurately calibrate the overload and signal light settings. The bi-metallic elements are not mechanically connected to the transformer leads; thus calibration remains constant and is not affected by operation of the breaker.

CONTACTS OF SILVER-TUNGSTEN have an interrupting capacity of 5,000 amperes. Low operating handle torque, combined with high contact pressure, results in a low-resistance circuit.

New L-M Breaker Provides Complete Coordination for RWP® Transformers

New Kyle-designed breaker provides operating advantages for L-M Round-Wound-Protected Transformers

By **A. R. WAEHNER,**
Director Transformer Sales,
Line Material Industries

All RWP transformer components are now of L-M design and manufacture, affording a Round-Wound-Protected transformer coordinated for optimum performance. The L-M Type T-3 heavy-duty lightning arrester protects the primary winding against lightning.

Fuse links in the primary leads protect the system by removing the transformer from service in the event of internal transformer winding faults.

Round-Wound® design provides L-M exclusive continuous cruciform wound core with round coils of high impulse and short circuit strength.

Drawing upon Kyle's vast experience in arc-interrupting devices, L-M now provides a secondary breaker that supplements the other L-M manufactured RWP transformer components. With this new breaker, Line Material provides a self-protected transformer that is completely coordinated for optimum performance.

For additional information, contact your local L-M Field Engineer—or write me at Line Material Industries, Milwaukee 1, Wisconsin.

LINE MATERIAL® Industries
McGRAW-EDISON COMPANY
Distribution Transformers

McGRAW EDISON

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DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT

Takes the shop to the job!

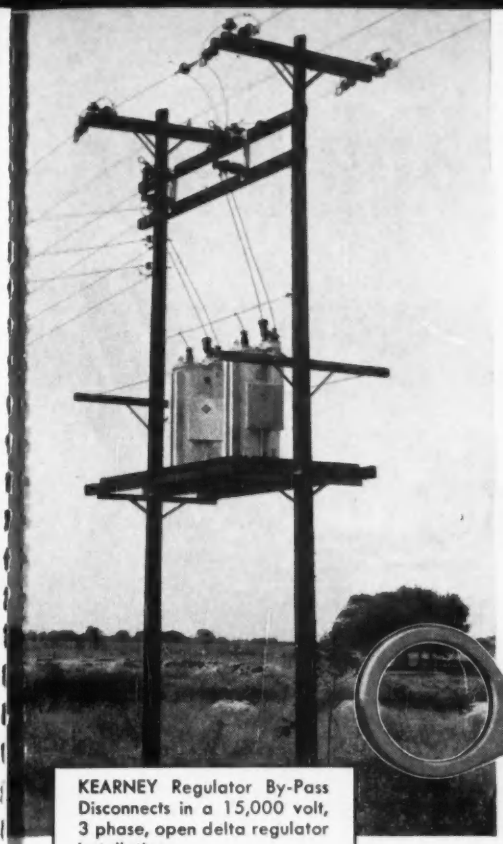
A ready-to-roll workshop on wheels . . . that's this versatile Dodge Tradesman, and it puts to use every available inch of space.

There's pick-up load space aplenty, with a lockable sliding roof to protect whatever you carry. Lock-up compartments for weatherproof storage of tools, fittings and supplies. Even a handy workbench . . . when you swing down the horizontal compartment doors. Ladder racks available.

Take your Tradesman with four or six compartments, powerful V-8 or economy Six, 3- or 4-speed transmission or push-button LoadFlite. No doubt about it—here's the service truck with the most! See your Dodge dealer for *all* the reasons why . . .

today,
it's real smart
to choose **Dodge Trucks**

For service calls in any kind of weather and over any terrain, you can't beat Dodge 4 x 4 Power-Wagons! This W500 with special utility-type body, for instance, combines Dodge dependability with two- or four-wheel-drive traction that goes anywhere. Winch and power take-off available.



KEARNEY Regulator By-Pass Disconnects in a 15,000 volt, 3 phase, open delta regulator installation.

Safe performance

of 4 operations in proper sequence assured by KEARNEY *REGULATOR BY-PASS* DISCONNECT

- **no danger of accidentally dropping load**
- **no hazard from interrupting exciting current**

With the same motion—in the same time—required to open *one* conventional disconnect, the KEARNEY Regulator By-Pass Disconnect:

shunts the line leads to by-pass the regulator—opens both leads to the series winding—safely interrupts the exciting current.

What's more, you realize substantial savings in cost of switches, installation time, supporting structure and leads, because *only one* KEARNEY By-Pass Disconnect is needed for each phase of a regulator installation, compared to *three* single-throw disconnects. And the operator has *maximum safety*, since all switches can be located on the same side . . . visible from one point!

JAMES R. KEARNEY CORPORATION, *General Offices:* 4224-42 Clayton Avenue, St. Louis 10, Missouri

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for BETTER CONSTRUCTION
SAFER MAINTENANCE
Specify KEARNEY PRODUCTS

JAMES R. KEARNEY CORPORATION ST. LOUIS MO. GUELPH, ONT.

The Mark of Quality

Plants at: ST. LOUIS • FAYETTEVILLE, ARK. • SHENANDOAH & CLARINDA, IOWA—GUELPH, ONT., CANADA

Take Advantage of Kuhlman's

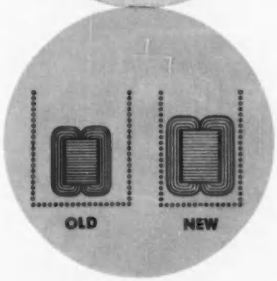
Big Bonus Year... Get More Transformer for Your Dollar—

MORE OF EVERYTHING NEW

New slim, trim look! Bigger core and coil; smaller, trimmer tank.

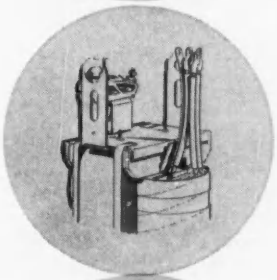
More copper—more steel—more economy—at no extra cost, no increase in weight.

Lower losses—more value—more bonus features. The biggest "value-packed" transformer ever offered by Kuhlman.



MORE PERFORMANCE

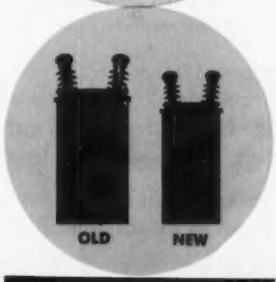
Lower exciting current—lower copper and core losses—improved impedance—better regulation—a new high in operating economy. This means less drain per transformer on your system—less revenue loss—more customer satisfaction.



NEW CONSTRUCTION

Mechanically stronger coil with greater specific dielectric strength. A newly developed thermo-setting insulation that bonds the windings into a tighter, more compact unit.

A new core and coil clamp that supports the coil independent of the core to give greater short circuit strength and less mechanical stress on the core.



SMALLER, TRIMMER TANK

A transformer bigger inside, yet smaller in all-over size. More transformer—more performance—more economy—in a smaller tank that takes up less room on the pole.

All this backed by Kuhlman's 65 years of proven reliability. All this at new, low prices.

It's Kuhlman's bonus year. You'll never get more for your transformer dollar. Ask your local Kuhlman representative for all the facts.

KUHLMAN TRANSFORMERS

KUHLMAN ELECTRIC COMPANY, Birmingham, Michigan

Manufacturers of transformers since 1894

PLANTS: Bay City, Mich.; Crystal Springs, Miss.; Salinas, Calif.

New Ford F-100 4-wheel drive Styleside pickup handles heavy loads and makes its own road.

ALL FORD-BUILT . . . FACTORY-ENGINEERED . . . FOR GREATER SAVINGS!

Go *Ford*-ward for 4-wheel drive performance at big Ford savings. New Ford 4 x 4 Pickups have the power and traction to go most anywhere. They're factory-engineered from the ground up for extra stamina, and all Ford-built with your choice of economical Short Stroke power—Six or V-8.

There's new versatility too, with two power take-off points in the transfer case to drive winches, saws, diggers, or other equipment. And there's new driving ease. You shift smoothly between 2- and 4-wheel direct drives while moving. Ford's *driverized* cab provides new riding comfort and modern styling.

Ford 4-wheel drive trucks are available in ½- and ¾-ton pickups, chassis-cabs and ¾-ton stake models. See your Ford Dealer . . . and save hundreds of dollars on America's lowest-priced 4 x 4's with Six or V-8 engine!

FORD TRUCKS COST LESS

LESS TO OWN . . . LESS TO RUN . . . LAST LONGER, TOO!

PUT FULL HOUSEPOWER TO WORK

Fast Recovery For Faster Selling, Greater Loads

Water heaters, with an average annual load factor of 47% and an average annual usage of 3600 KWHR, build loads and profits better than any other household appliance. And, to help you add more of this important business to your lines, Hotpoint offers 40-gallon round and table-top models with the fast recovery today's consumer demands. They provide 470 gallons of hot water every 24 hours – more than 6 times the average family's daily requirements. And, they save space and money by eliminating large storage tanks. Display and promote Hotpoint fast-recovery water heaters for greater earnings.

Model WBA42-1

15-YEAR WRITTEN PROTECTION PLAN ON DELUXE MODELS

One-year warranty on the complete heater, and an additional 7-year replacement warranty on the tank, plus an additional 7-year tank exchange plan. 10-year written protection plan on "Silver Line" Models.

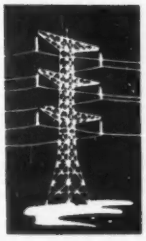
Additional Hotpoint features your customers will want:

MIRACLE MLC-7 ADDITIVE fights rust and corrosion, can lengthen tank life as much as 200%, depending on condition of water.

GENUINE CALROD® MAGIC CIRCLE® HEAT—the most widely used heating units in the world. Famous for efficiency and long life.

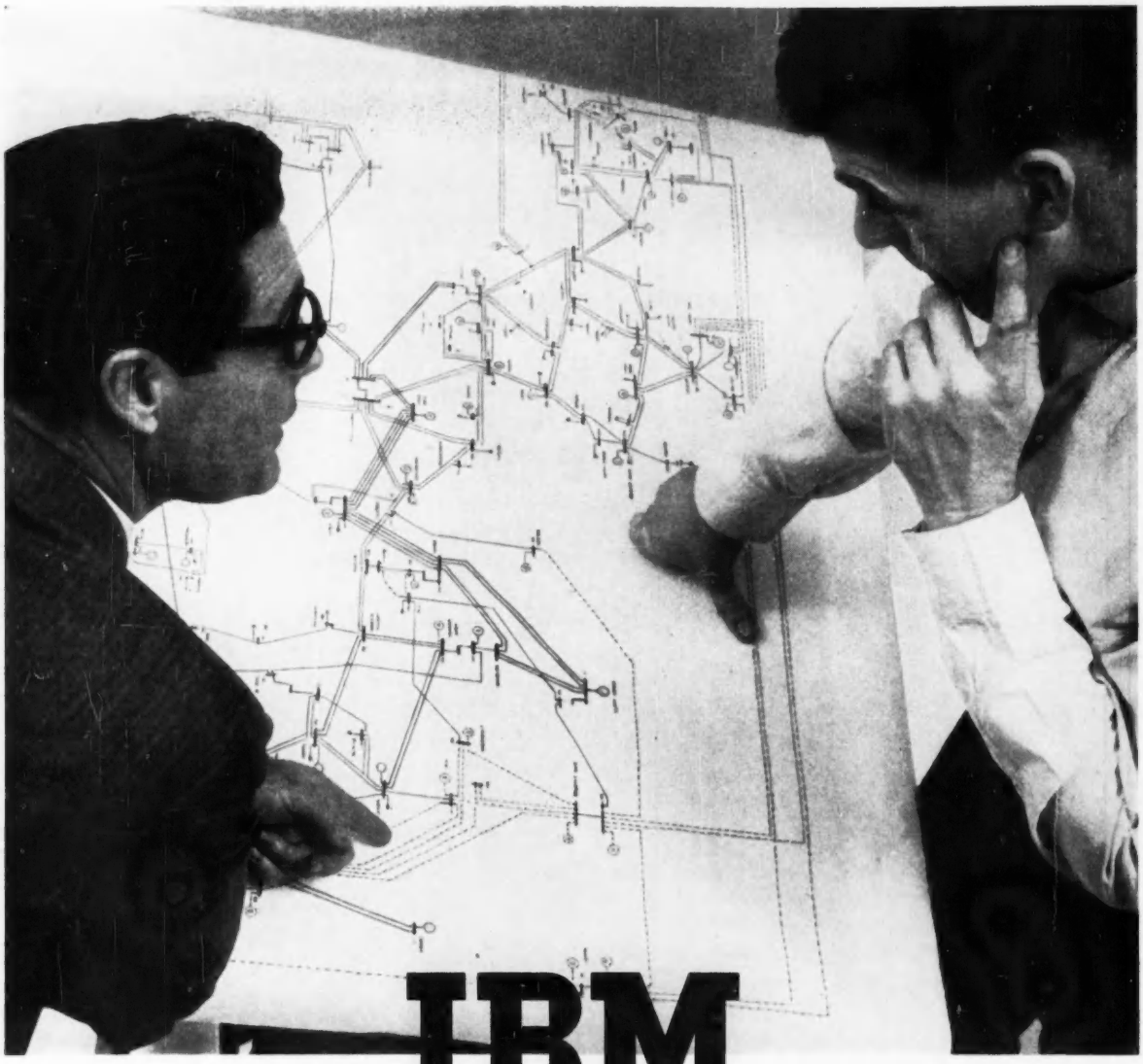
PROVEN LEADERSHIP—over ⅓ of all electric water heaters have been made by Hotpoint, and less than 1% have ever needed service.

LIVE BETTER ELECTRICALLY



LOOK FOR THAT **Hotpoint** DIFFERENCE

A Division of General Electric Company, Chicago 44, Illinois



IBM® COMPUTERS GIVE FAST ANSWERS TO SYSTEM PLANNING PROBLEMS

Today, load flow studies vital to all system planning areas, previously taking weeks by former methods, are done in **hours** with IBM digital computers. And—at a fraction of the cost.

System data is easily placed on punched cards or magnetic tapes and fed into an IBM digital computer. The base case is calculated and recorded. The computer then proceeds automatically from case to case. In a matter of seconds the engineer has available a complete print-out of all system load conditions, voltages, phase angles and system losses. Thanks to IBM equipment he is free to devote more time to creative system planning.

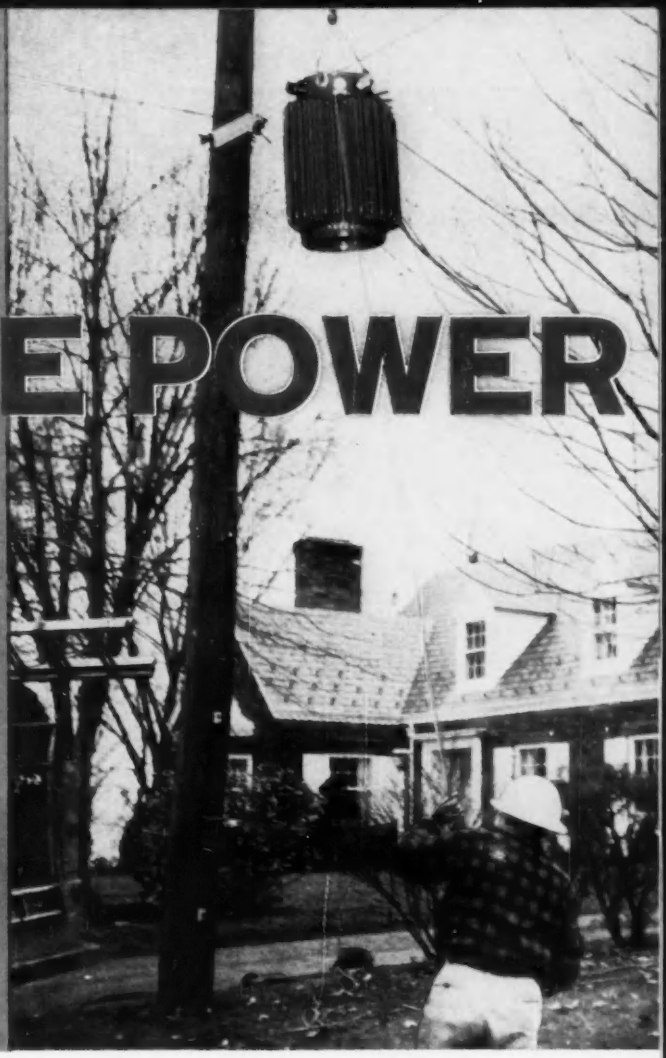
The IBM digital approach offers several important advantages: accuracy sufficient for loss studies, no transcription errors, ability to study high- and low-voltage systems using a common MVA base, table look-up operations, fast logical decisions. Not confined to special purposes, IBM equipment is easily time-shared by all public utility departments for maximum usage and mutual benefits. For the engineer, accountant or operating man, IBM computers are powerful tools solving the problems of ever-expanding utility systems.

Call your local IBM representative today for more detailed information on IBM digital computers—engineering time-savers you shouldn't overlook.

INTERNATIONAL BUSINESS MACHINES CORPORATION, 590 MADISON AVE., NEW YORK 22, N.Y.

You get more POLE POWER with Pennsylvania's new 250-kva featherweight POLE STAR TRANSFORMER

Costs 15% less than station-type transformer



In 1953, Pennsylvania pioneered "higher kva" pole-mounting by introducing the 167-kva Featherweight Pole Star—an innovation that soon led to a revision of industry standards. Now, Pennsylvania extends to 250 kva the operational and economic advantages of its Featherweight pole-type design.

The ability to put 250 kva on one pole with a single transformer permits utilities to satisfy increasing demands by replacing lower rated pole-type transformers and avoiding the added expense of platforms or vaults. If, on the other hand, a utility's operating practices preclude pole-mounting of 250-kva units, the 15% *lower cost* of the new Featherweight Pole Star can apply also to platform, ground pad or vault installations.

The smaller size, lighter weight and lower cost of the new 250-kva Featherweight Pole Star are accompanied by *overall improvements in electrical characteristics*. Compared to a 250-kva station-type unit, the new Pole Star has lower losses, greater efficiency at all load percentages, better regulation, lower exciting current, and lower impedance. It features the same ease-of-handling as its 167-kva forerunner.

Before your next 250-kva purchase—whether for pole-top or some other type of installation—it will pay you to consider the lower cost and other advantages of Pennsylvania's new 250-kva Featherweight Pole Star, available through 15 kv. Contact Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pennsylvania.

A STATISTICAL COMPARISON

250-Kva Featherweight Pole Star vs. Station-type
(*Example:* Transformer rated 7200/12470Y—120/240 volts; with taps)

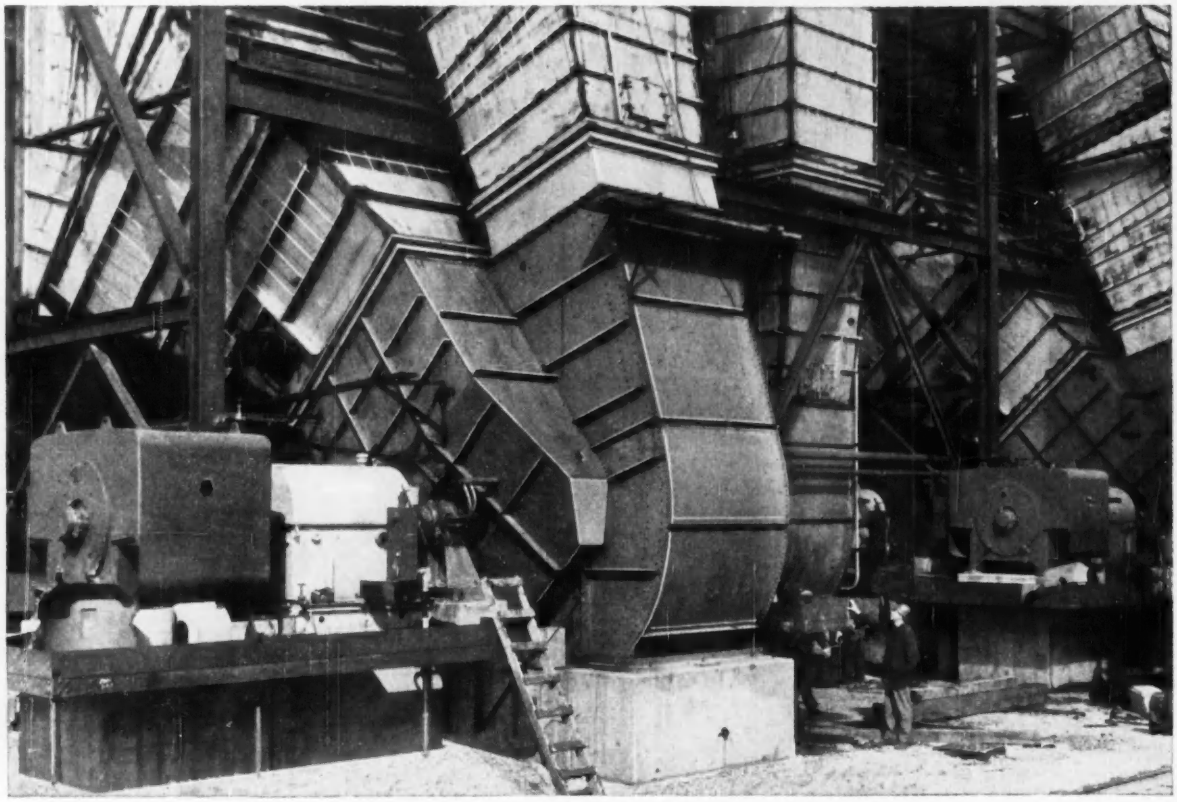
	Featherweight	Substation-type	% Smaller or Lighter
Overall Height	59 in.	81 in.	27.1%
Width	36¼ in.	37 in.	2.0%
Depth	31½ in.	46 in.	31.5%
Net Weight	1750 lbs.	3400 lbs.	48.5%

ALL ELECTRICAL CHARACTERISTICS HAVE BEEN IMPROVED COST REDUCED APPROXIMATELY 15%

PENNSYLVANIA DISTRIBUTION TRANSFORMERS

McGRAW EDISON

POLE STAR



LOOKING FOR PEAK EFFICIENCY OVER BROAD RANGE FOR YOUR DRAFT FANS?

Here's Why "Buffalo" "BLH" is Best Answer:

The "Buffalo" Family of "BLH" Fans is designed for highest mechanical efficiency over an extremely broad operating range. Rugged "Buffalo" construction insures economical, dependable operation throughout a long, trouble-free life.

"Buffalo" Type "BLH" features include: streamlined housing designed to deliver ultra-smooth air flow, peak static conversion and pressure distribution at outlet — turbulence minimized by smooth inlet bell, directional inlet vanes, backward-curved blades, matching rotor flange and inlet bell and gradually divergent outlet. These features all add up to the quiet, powerful, smooth performance characteristic of the "BLH".

Reliable, maintenance-free operation is the result of extra-heavy construction throughout. This includes sturdy steel plate construction ruggedly welded for extra strength — oversized shafts and bearings. Rotors are statically and dynamically machine balanced at factory.

If your mechanical draft conditions require a dependable fan that provides high efficiency over a broad operating range, ask your "Buffalo" engineering representative for complete facts about the "Buffalo" family of mechanical draft fans. Or you can write us direct for Bulletin FD-905.

"Buffalo"

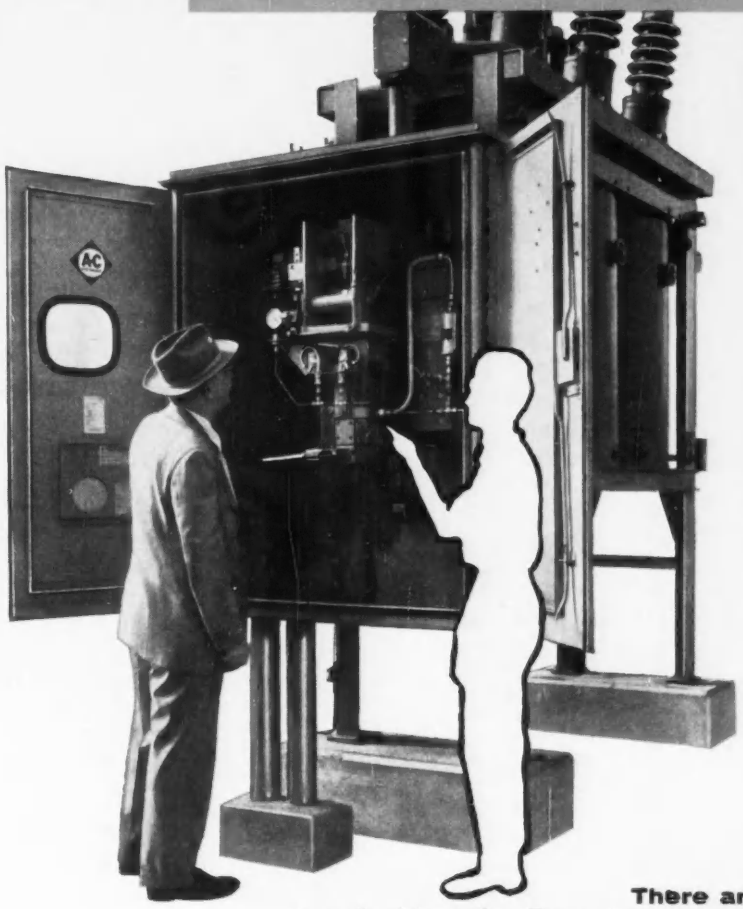
BUFFALO FORGE COMPANY
Buffalo, N. Y.

Buffalo Pumps Division • Buffalo, New York
Canadian Blower & Forge Co., Ltd., Kitchener, Ontario

VENTILATING • AIR CLEANING • AIR TEMPERING • INDUCED DRAFT • EXHAUSTING • FORCED DRAFT • COOLING • HEATING • PRESSURE BLOWING

ALLIS-CHALMERS modern line for '59

Look at the NUTS and BOLTS



There are no short cuts to modernizing today. Few systems are so completely outmoded that the steps needed to modernize them are completely obvious.

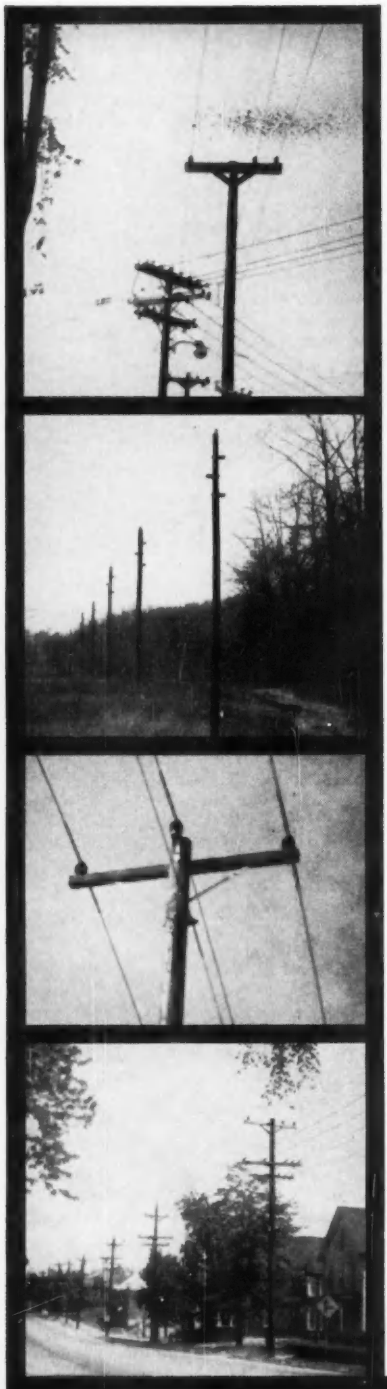
However, as equipment manufacturers, we at Allis-Chalmers see several areas which offer considerable potential for improvement among a wide group of utilities. One of these is what we call "Looking at the nuts and bolts."

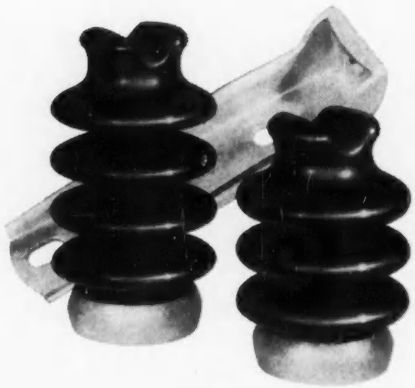
Functionally, electrical equipment is standard today, but there's still room for the designer's genius. Looking at the nuts and bolts is one way you have of getting the best . . . the most modern . . . the equipment with the most unusual and helpful features.

A-5993-E

ALLIS-CHALMERS

On the following pages are items of Allis-Chalmers equipment we recommend for the design "extras" that can help your company stay modern.





LAPP DISTRIBUTION POSTS

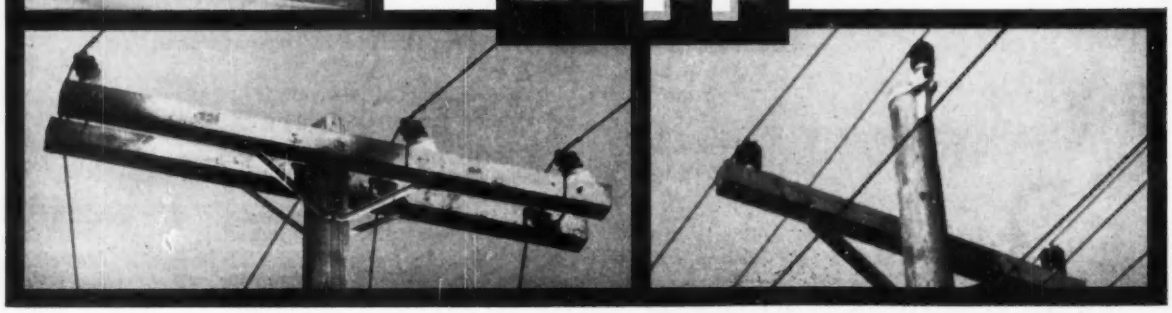
Line Post reliability for distribution lines up to 27 kv

No distribution line you can build will serve as dependably, save as much sleep for your maintenance crews, or build as much customer good-will, as the one you put on Lapp Distribution Posts. These trim-appearing "junior Line Posts" just won't puncture . . . their solid one-piece porcelain body separates conductor from ground for its full length. Won't crack either . . . the only metal-to-porcelain joint is at the base; loading of porcelain is only in large-area, low-intensity compression. Greatly more resistance to flashover and impact, too . . . has short super-sturdy petticoats, with extra protection against failure in the fact that when petticoats are broken away, the post body remains intact with almost its full insulating values. Completely free of radio- or TV-interference at any operating voltage. Fog-type for superior performance in dust or atmospheric contamination.

Where else can you get so much for so little cost? Better look into it.

Lapp Insulator Co., Inc., Le Roy, New York.

Lapp



ALLIS-CHALMERS modern line for '59

Caliband Control

Adds accuracy • Cuts human error • Saves time

For the first time you can adjust or test voltage level without changing customer voltage or interrupting regulating service. In addition, human error is eliminated because compensator elements need not be set to zero before testing voltage level. *Caliband* control does it automatically. All of this saves time.

Caliband unit makes Allis-Chalmers regulator controls simpler to set and more accurate.

Caliband control is standard on all Allis-Chalmers regulators. It may be purchased separately, however, for use in adjusting or testing voltage level on earlier model Allis-Chalmers regulators on your system.

See it in action! *Caliband* control can be demonstrated on your desk with an actual unit. Contact your nearby A-C office or Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Plan to stay ahead... MODERNIZE!

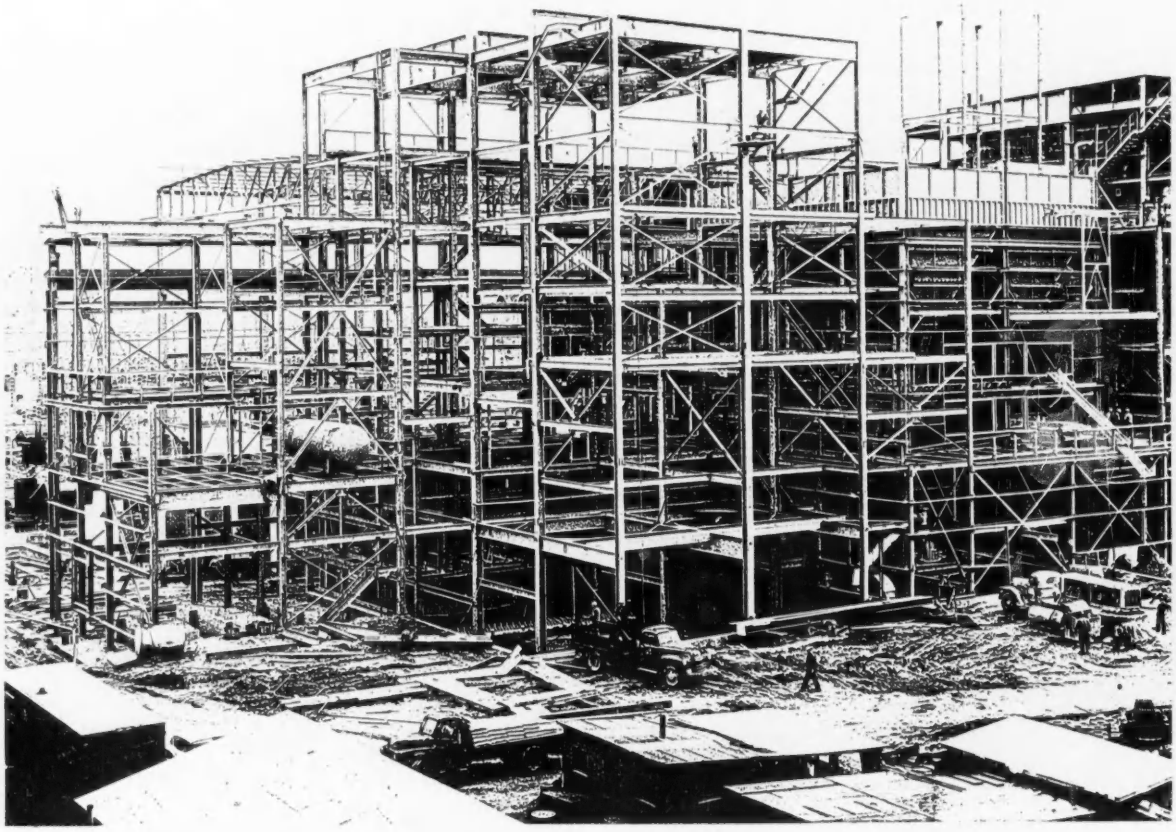
Caliband is an Allis-Chalmers trademark.

Originators of 5/8% step regulators

ALLIS-CHALMERS

A-1040-E

another example of **INGALLS SKILL**
in fabrication and erection of Structural Steel



McMeekin Station, Unit Number Two

new South Carolina Electric and Gas Company expansion

South Carolina's electric power capacity grows as Unit Two of McMeekin Station at Irmo, South Carolina is completed.

For this new South Carolina Electric and Gas Company Plant expansion, more than 1200 tons of fabricated steel and platework were supplied by The Ingalls Iron Works Company, and erected by The Ingalls Steel Construction Company.

Here is another example of INGALLS skill in fabrication and erection of structural steel for power houses. South Carolina Electric and Gas Company is one of the 46 leading power companies in this country who have used INGALLS facilities for fabrication and/or erection of structural steel for their power plants.

When you need fabricated structural steel—INGALLS is ready to serve you. Your inquiry is invited.

Engineers and Architects: Gilbert Associates, Reading, Pennsylvania

Structural Steel Fabrication: The Ingalls Iron Works Company

Structural Steel Erection: The Ingalls Steel Construction Company

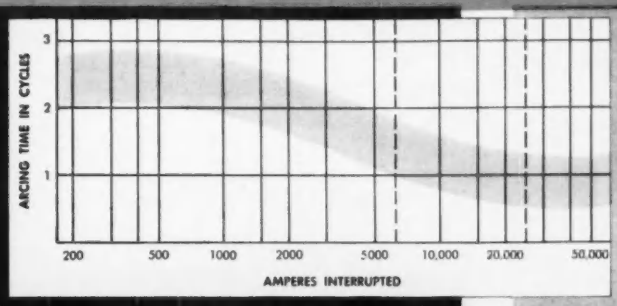
STEEL PLATE FABRICATORS ASSOCIATION FOUNDED 1933

AISC

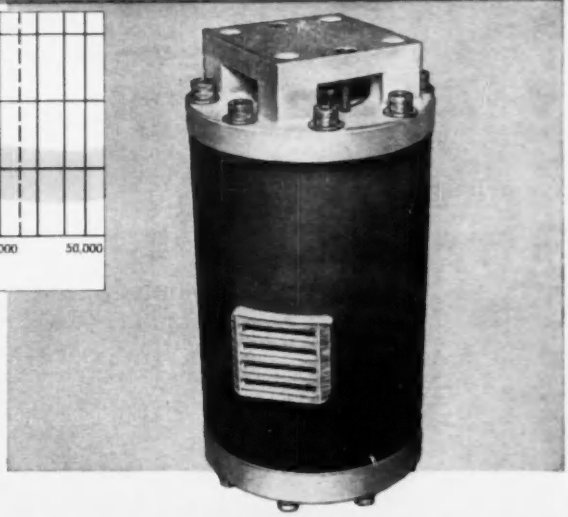
THE INGALLS IRON WORKS COMPANY
Executive Offices
BIRMINGHAM, ALABAMA

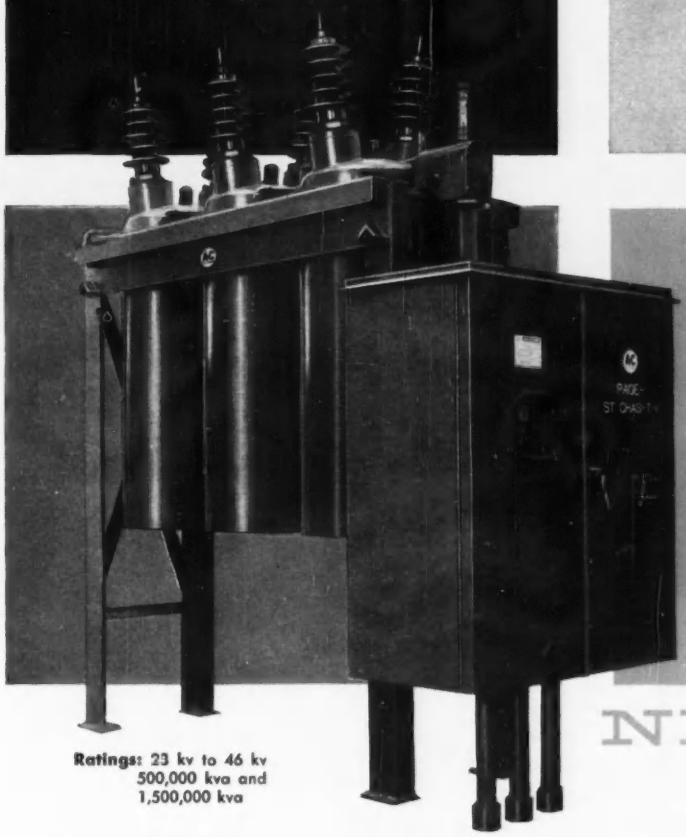
INGALLS INDUSTRIES ARE: **The Ingalls Iron Works Company,** Sales Offices: New York, Pittsburgh, Chicago, Houston, New Orleans, Atlanta • **The Ingalls Steel Construction Company,** Sales Offices: New York, Chicago, New Orleans, Pittsburgh, Houston, Atlanta • **Birmingham Tank Company,** Sales Offices: New York, Pittsburgh, Chicago, Atlanta, New Orleans, Pascagoula • **The Ingalls Shipbuilding Corporation,** Shipyards: Pascagoula, Mississippi; Decatur, Alabama Sales Offices: New York, Chicago, Washington, Houston, New Orleans, Atlanta

ALLIS-CHALMERS modern line for '59

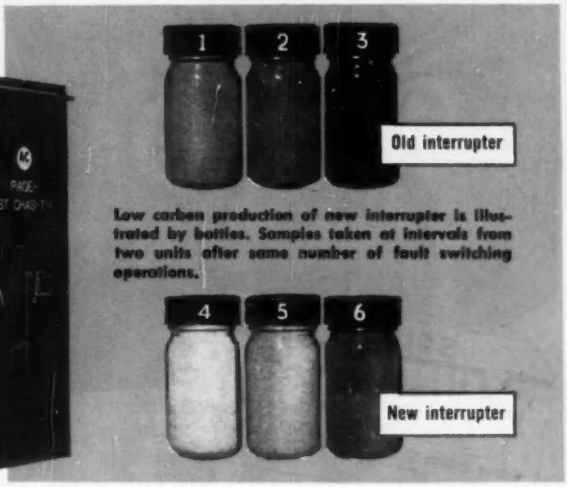


Graph shows short arcing times.





Ratings: 23 kv to 46 kv
500,000 kva and
1,500,000 kva



Low carbon production of new interrupter is illustrated by bottles. Samples taken at intervals from two units after same number of fault switching operations.

NEW interrupter cuts oil contamination

Reduced arcing time . . . less carbon . . . characterize new interrupting device for Allis-Chalmers frame-mounted breakers.

Contamination due to circuit interruption is greatly reduced . . . dielectric strength is extended.

Tests consisted of fault switching operations at current levels of 200 to 40,000 amperes.

Five-cycle operation

This new interrupting device with its matching high-speed *Pneu-Draulic* operator provides fast operation: closing, reclosing and interruption.

For complete details on Allis-Chalmers frame-type breakers, contact your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Pneu-Draulic is an Allis-Chalmers trademark.

A-5916-E

ALLIS-CHALMERS

IF YOU WANT COMPLETE SAFETY IN YOUR SAFETY SWITCHES—

REMEMBER THE "V" FOR

VISIBLE BLADES!

The men who pull the switches will tell you what can happen when a switch, *believed* to be open—*isn't.* A lot of things can happen—and every one of them is bad. Personnel safety is in jeopardy. Motors can single-phase. Machinery and work can be damaged. Down-time can skyrocket.

Doesn't it make sense to insist on Visible Blade construction which gives you a road block against any of those possibilities? Doesn't it make equally good sense to insist on the safety switch which gives you that construction—plus a lot of other performance advantages?

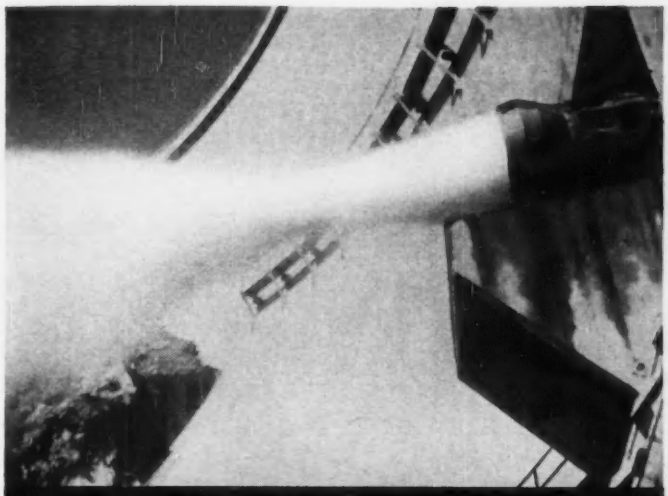
NEW!
TYPE LD SWITCH

Quality Features at Low Price

- ✓ Spring-operated quick-make, quick-break
- ✓ Box lugs. Easy to wire No looping
- ✓ Compact enclosure, yet lots of wiring space
- ✓ Positive pressure (spring loaded) fuse clips
- ✓ Full horsepower ratings

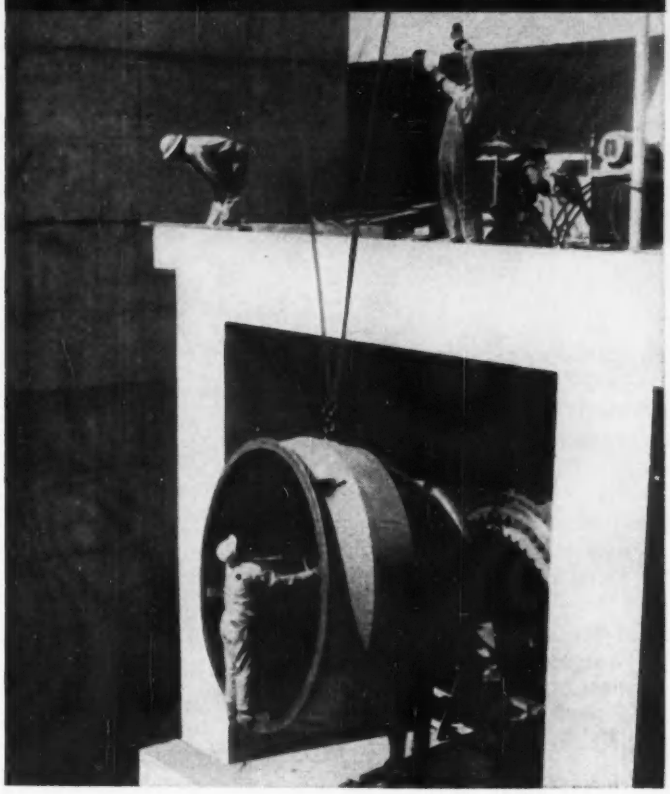
EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE

SQUARE D COMPANY



This 18-inch Ring-Jet Valve, installed by the City of Bremerton, Washington, is manually operated. Under a 115-foot design head, it discharges 76 MGD when fully opened. Note how the hood concentrates the discharge stream.

One of two 66-inch A-C Ring-Jet Valves during final assembly at Tulloch Dam, California. These valves are used for an irrigation bypass, operate under a 145-foot head.



RING-JET VALVES

for easy regulation and control of water under free discharge

Allis-Chalmers Ring-Jet Valves are a logical development from the Howell-Bunger Valve. For use under high- and low-head, free-discharge conditions, the A-C Howell-Bunger creates a substantial amount of spray in providing maximum dispersion to minimize erosion. Now, in the A-C Ring-Jet Valve, the addition of a steel hood creates a concentrated jet, reduces spray, and helps dissipate the energy in the discharged water.

This new A-C Ring-Jet Valve gives you the simple construction, radially-balanced hydraulic design and easy operation of the A-C Howell-Bunger Valve, while very nearly matching its high discharge coefficient. Ring-Jet Valves are available with standard manual and/or motor-driven operators. Hydraulic operation can be provided, and is especially applicable to the larger sizes and higher head applications.

To obtain complete information on the A-C Ring-Jet Valve, contact your nearest Allis-Chalmers office, or write Allis-Chalmers, Hydraulic Division, York, Penna.

Hydraulic Division

RESEARCH | DESIGN
HYDRODYNAMICS
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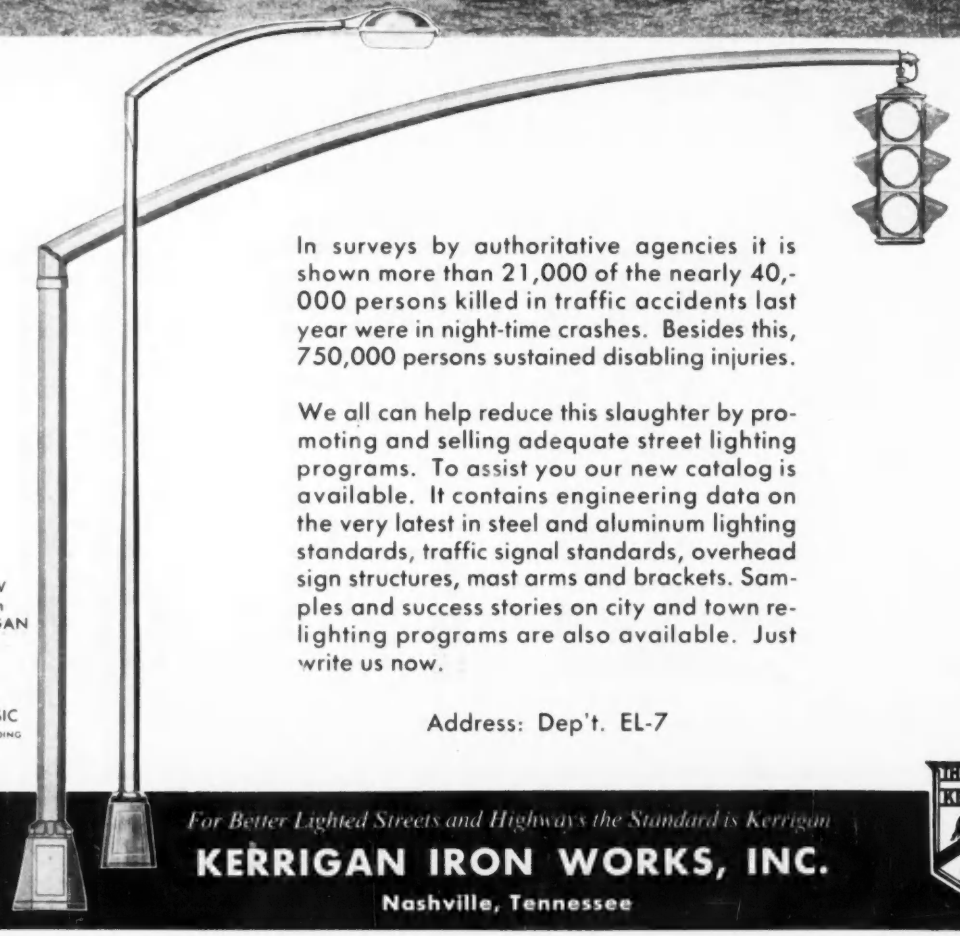
Hydraulic Turbines & Accessories • Pump-Turbines • Pumps • Liquid Heaters
Rotovalves • Ball Valves • Butterfly Valves • Free-Discharge Valves

ALLIS-CHALMERS

Night-time Crashes can be *REDUCED* By Selling ADEQUATE Street Lighting



In surveys by authoritative agencies it is shown more than 21,000 of the nearly 40,000 persons killed in traffic accidents last year were in night-time crashes. Besides this, 750,000 persons sustained disabling injuries.

We all can help reduce this slaughter by promoting and selling adequate street lighting programs. To assist you our new catalog is available. It contains engineering data on the very latest in steel and aluminum lighting standards, traffic signal standards, overhead sign structures, mast arms and brackets. Samples and success stories on city and town relighting programs are also available. Just write us now.

Address: Dep't. EL-7

NEW from KERRIGAN — THE CLASSIC Pat. Pending

For Better Lighted Streets and Highways the Standard is Kerrigan

KERRIGAN IRON WORKS, INC.

Nashville, Tennessee

Here's proof that neoprene jacketing resists flow

Above, you see two samples of electrical cable which were compressed for 8 hours under 75 psi at 302° F. The neoprene-jacketed cable on the left retained its shape . . . retained its protective qualities. The thermoplastic material was severely damaged . . . completely lost its protective qualities.

In addition to resisting distortion under heat and pressure, neoprene jacketing resists ozone, chemicals, aging and weather . . . stays resilient at sub-zero temperatures . . . resists impact, cutting and gouging.

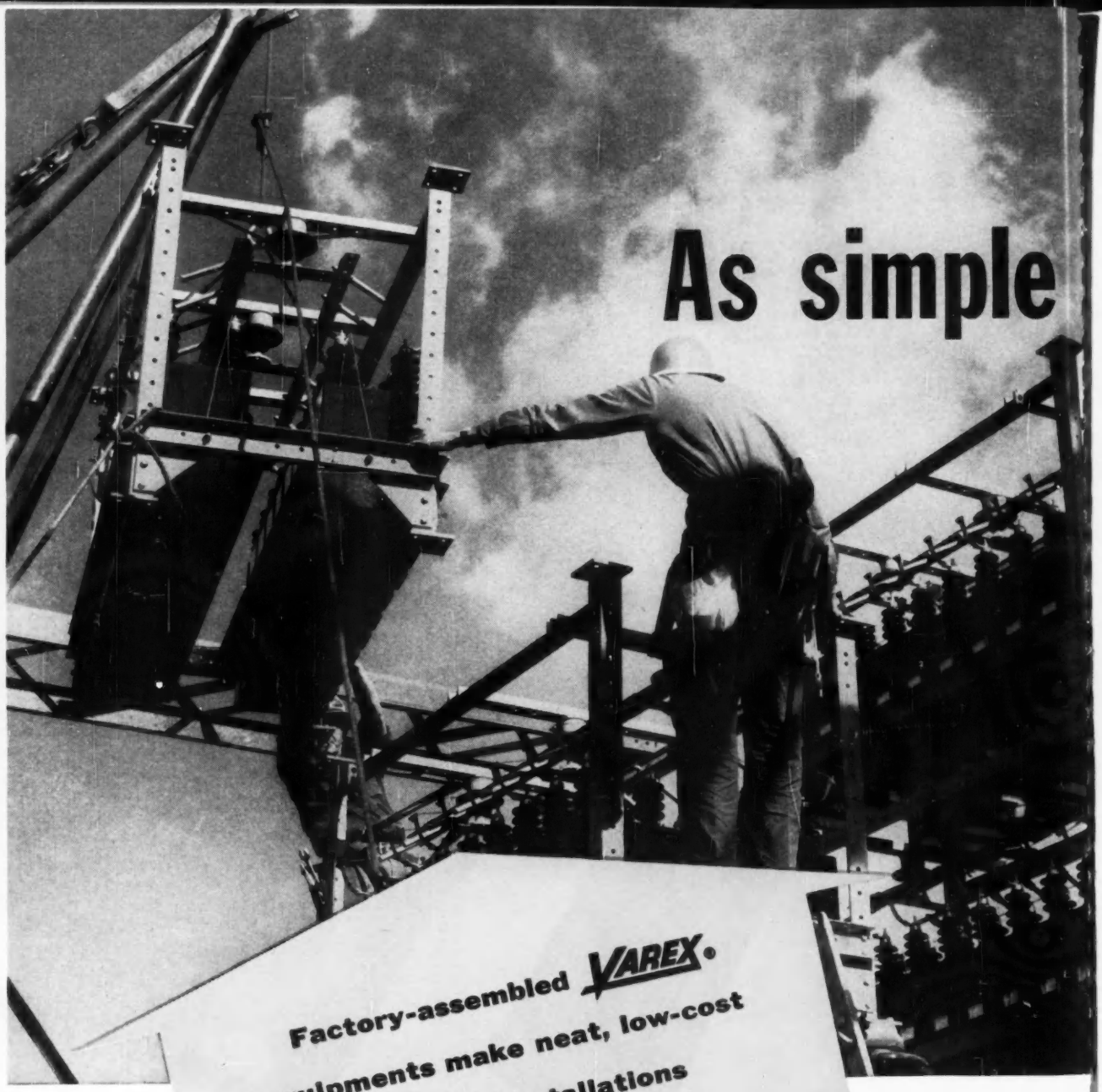
For long, economical service, protect *your* cable with neoprene jacketing. Write for complete facts. E. I. du Pont de Nemours & Co. (Inc.), Elastomer Chemicals Dept. EW-7, Wilmington 98, Delaware.

DU PONT
REG. U. S. PAT. OFF.

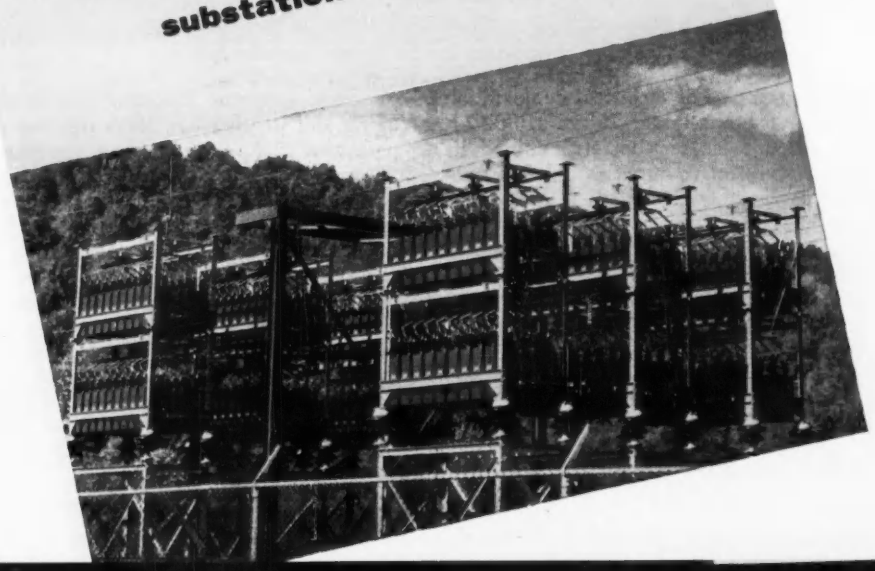
SYNTHETIC RUBBER

NEOPRENE
HYPALON®
VITON®
ADIPRENE®

Better Things for Better Living . . . *through Chemistry*



Factory-assembled VAREX® equipments make neat, low-cost substation installations



as building with blocks

Shown under construction are two 5400-KVAR banks of O-B Varex capacitors. Each of the 12 blocks of 900 KVAR was assembled at the O-B factory, wired, individually fused and sent to the customer ready to install, together with elevating substructures.

To assure alignment of bolt holes, racks are jig assembled at the O-B factory. The value of this care was evident in the installation at the left. Construction of the two banks started shortly after 9 a.m., was completed by 3:30 p.m., by a four-man crew. More important than speed of installation was convenience. The large units fitted together as easily as a child's building blocks.

Installations like this one are typical of the various types of equipments that O-B now furnishes to capacitor users. You can get O-B equipments switched or unswitched, for pole-top or substation installation, wired or unwired, in a choice of configurations. This gives you literally thousands of combinations from which to choose.

Your O-B representative would certainly appreciate the opportunity to discuss your next capacitor equipment order with you.

OHIO BRASS COMPANY, MANSFIELD, OHIO

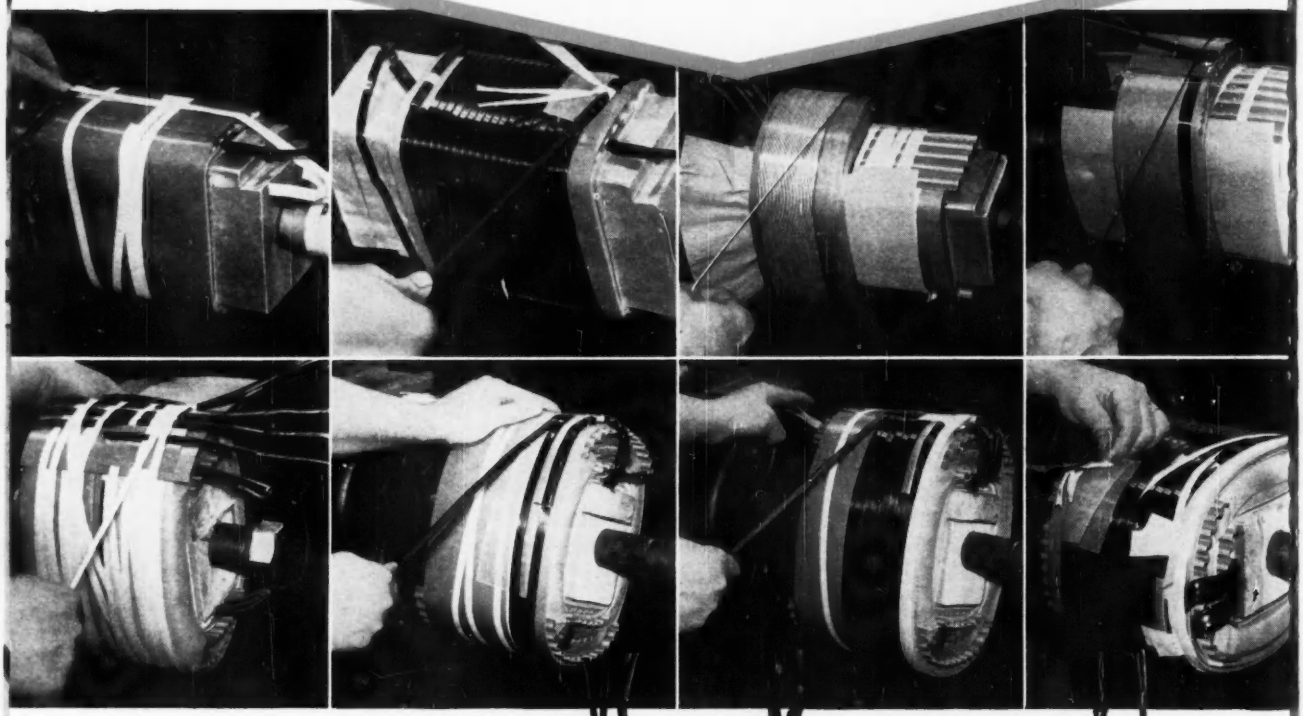
4965-H

Ohio Brass

MOLONEY DISTRIBUTION TRANSFORMER COILS . . . DESIGNED FOR PERFORMANCE

The coils used in Moloney Distribution Transformers are composed of materials especially selected and carefully tested for this specific application. These materials, used under the supervision of experienced transformer design engineers, result in a mechanically-strong, electrically-efficient coil. One feature of this coil is the low impedance which results in improved voltage regulation and therefore increased revenue and better customer relations. Specify the transformers designed for performance . . . Specify Moloney Transformers . . . All Along The Line.

M1561-3



Turns anchored in place.

HV winding sectionalized to reduce layer stresses.

Thermo-setting resin-coated paper used between layers.

All leads vinyl covered where they are brought through the coil.

Cooling ducts strategically located.

LV-HV-LV sequence of coils gives optimum clearance from HV to ground.

Extra insulation on coil leads, connections and taps.

MOLONEY ELECTRIC COMPANY

Manufacturers of Transformers for Utilities, Industry, and Electronic Applications

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO., AND TORONTO, ONT.

Editorial Comment

JULY 13, 1959

The Fight on the Man-hour Must Continue

Recent wage settlements between utility companies and the unions confirm the constant pattern of rising labor rates. There seems no escaping labor's demands for higher wages and greater benefits. As always, the utilities' only answer lies in constant vigilance to find means of reducing the proportion of labor cost to total expense.

Actually, the utility companies have done a wonderful job on this over the past decade. While average utility employee weekly earnings rose from $67.81 to $100.61 from 1950 to 1958, the allocation to salaries and wages of the revenue dollar dropped from 20.7 to 17.7 cents.

This remarkable performance is due to holding the total number of employees about level while utility capacity and output move upward. This was made possible by more easily operated, more easily maintained plant—plus the myriad of other efficiencies contributed by engineering and management techniques.

The fine record of the past years must be extended, since it is clear labor rates are continuing upwards. To accomplish this, utility management must exercise every ingenuity in the fight on the man-hour.

Hi Lines on Railroad R/W Can Be Feasible

Use of railroad right-of-way for transmission lines today is becoming more and more attractive to electric utilities in metropolitan areas of the Northeast where new easements and rights-of-way are scarce and expensive. Here, in two states alone, nearly 200 circuit miles of line of 66- to 230-kv have been completed or are now being built on railroad property by a half dozen utilities.

Such ventures as these can be economically feasible, in spite of high construction costs and generally stiff leasing charges, in situations where new transmission right-of-way either isn't available or where condemnation proceedings are discouraging or prohibitive.

However, the use of railroad right-of-way has both advantages and drawbacks. By using railroad property electric utilities can expect to gain an established right-of-way of generally satisfactory width that is cleared of most potential hazards. Frequently, however, railroad property isn't wide enough to construct the standard wide-base, cross-country type of high voltage tower. Special structures are usually required to keep both structure and conductors inside the limits of the railroad right-of-way.

Comparisons indicate that transmission line structures built on railroad right-of-way generally cost more than normal construction due chiefly to physical interferences, necessary modifications of existing facilities, and the need for more structures per mile because of right-of-way limitations, track alignment and electrical clearances.

But in the final analysis when these extra construction costs and land rentals are matched against the cost of new right-of-way in congested areas, the use of railroad property frequently reveals advantages that can be mutually attractive to both parties . . . provided rental charges are kept within reason.

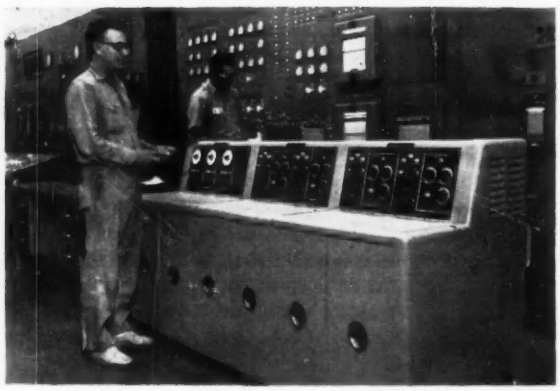
OUTGOING SIGNALS from two consoles at Chicago power supply control room regulate changes in output of plant units. Console equipment bases choice on factors like unit efficiency, fuel costs and transmission costs

Automation Handles 92% of Output

Commonwealth Ed's new $700,000 dispatch system regulates 37 units at ten power plants for most economical production

The big assignment of exactly regulating production in ten plants of Commonwealth Edison Co now depends on electronic computers. Installation of a $700,000 automatic dispatch system has been completed for the Chicago-based utility and control equipment was placed in service late last month. The cost included expense of installation.

Built by General Electric Co, the new system ties together 37 steam units, some as far away as 140 mi, with a total capability of 4,634,000 kw. This output is equal to about 92% of Commonwealth Edison's total capacity.



INCOMING SIGNALS regulate four Ridgeland plant units in conjunction with equipment at nine other stations

"The device not only regulates electricity output to match demand, it also selects which of the 37 turbine generators can most economically produce additional electricity as required," said Willis Gale, the utility's board chairman. "Conversely, when the demand is decreasing the device selects the turbine generators producing electricity at the highest cost and reduces the output of those units."

A downtown Chicago power supply control room houses the central portion of the installation. The equipment determines the increment amount of generation needed and instantly translates it into a cost-of-power bid. This bid goes to the plants where similar control equipment assigns load to units that can produce power at this cost.

Fuel, Transmission Costs Help Pinpoint Right Unit

The computer determines which generating unit can carry a given electrical load most economically on the basis of such variables as the efficiency of the individual turbine generators, fuel cost, and transmission cost to the point of use.

The dispatch system ties in units at four plants in Chicago as well as the Joliet and Waukegan stations; Ridgeland station at Stickney, Will County station near Lemont, State Line station at Hammond, and Powerton station near Pekin.

Not only will the system assure most efficient use of power production facilities but will also maintain proper flows on power interchanges with other interconnected utilities who are in the same power pool with Commonwealth Ed.

As the company pointed out, the dispatch system will encounter load variations of as much as 50,000 kw from one minute to the next. Commonwealth Edison Co serves 2-million customers in the Chicago area and in northern Illinois.

Decisions In Sight on Key Power Issues

If veto comes on TVA bill, supporters lack votes to override it. Neuberger postpones his push, Trimble bill called up

Congress is coming within sight of the end of the current session—and within sight of deciding key issues to electric power.

One key measure, bond financing for TVA, was being readied for Senate passage late last week. HR-3460 still must go before a House-Senate conference committee to iron out differences of the two versions before it goes to the White House. Whether the President will sign or veto the bill is an unknown factor. One thing is certain: if he vetoes the bill, it's dead. Supporters have no hope of mustering enough votes to override a veto.

The House version has a fairly strict territorial limitation but less effective controls than the Senate version (EW, July 6, p 50). Neither calls for Budget Bureau control.

TVA would be limited to its July 1, 1957 service area, except for eight specifically-exempted towns, with the House version. The Senate bill would add three more towns and a 2,000-sq mi expansion territory—limited to 500 sq mi in a single state—beyond what TVA served on July 1, 1957.

TVA would be exempted from jurisdiction of the Government Corp Control Act, but left under provisions of the "Buy American" Act in the House measure while the Senate version would do just the opposite. The Senate bill provides a 90-day opportunity for disapproval of a bond issue.

Rural Loan Fund Approved

Congress has approved a $139-million appropriation for rural electrification loans during fiscal year 1960—not including carryover funds—and White House approval appears certain. Congress also voted REA a $25 million contingency fund for loans and $9.6-million for administration, exactly what Eisenhower wanted.

FPC's fiscal 1960 budget is included in an appropriation bill now awaiting action by a Senate-House conference committee. The House voted $7,062,000 for FPC operations; the Senate voted $7,374,000. The Budget Bureau has requested $7,425,000 with an eye toward stepping up natural gas rate application processing.

A federal public works appropriation of about $1.17-billion was awaiting final approval by the Senate Public Works Committee last week. The bill passed the House in early June. It called for initial funds for only one new hydro start: the Army Engineers' 260,000-kw Little Goose Project on the Snake River. Continuing funds for construction were included for Glen Canyon, Oahe, Ice Harbor, and John Day projects, plus additional planning funds for the Bruces Eddy, Lower Monumental, and Potomac River Power projects. Also included in the House bill was $32,582,000 for Bonneville Power Administration and $15,286,000 for TVA.

Sen Richard Neuberger's proposed legislation for a Bonneville Power Corp with utility responsibility is up for hearings July 15-16 before the Senate Public Works Subcommittee on Rivers and Harbors. Neuberger, who lost much of his earlier support for the bill because of a softening clause on preference, admits his present bill is for discussion only. He won't try for enactment of the bill for another year or so.

The Trimble bill (HR-8) also was called up last week for a two-day hearing before the House Public Works Committee. This calls for a reduction in the percentage of costs assessable against power at federal multi-purpose projects. In effect, the bill would lower federal power rates by charging off a larger part of the cost of such projects to non-reimbursable uses, such as flood control or navigation. Sen Robert Kerr has introduced a similar bill in the Senate but no action has been taken on it.

AEC Contracts Open Way for Superheat

Two development contracts awarded by the Atomic Energy Commission are expected to open the way for "realistic designs" of future boiling water power plants using nuclear superheat.

The contracts, totaling $4.3-million, went to General Electric Co and Combustion Engineering-General Nuclear Engineering Corp. They were among nine firms submitting proposals in response to an invitation last March for development of concepts and materials most suitable for advanced power reactors using superheated steam.

The work to be performed by Combustion Engineering will relate to integral superheated reactors, while the GE contract is concerned mostly with separate superheaters.

AEC says sufficient work will be performed by Combustion Engineering by the end of the year to permit the commission to proceed promptly with final design and construction of a prototype plant—provided the engineering development effort is satisfactory. The firm already is conducting a study for the Puerto Rico Water Resources Board, but AEC has not committed itself on whether the superheat reactor prototype will be built in Puerto Rico.

GE says its project will be carried out at its San Jose, Calif, facilities and its Vallecitos Atomic Laboratory at Pleasanton, Calif.

A company spokesman notes that the superheating process, involving reintroduction of saturated steam to a nuclear heat source to boost its temperature, should bring a 10% increase in the efficiency of the energy conversion.

This should permit future expansion of the kilowatt output of nuclear power plants while simultaneously reducing capital cost of turbines and auxiliary equipment, says George White, general manager of GE's atomic power equipment department.

The firm in May produced the nation's first nuclear superheated steam in a GE-financed experiment.

Power Output Follows Temperature Rise

Air conditioning loads and humming industrial activity boost sendout total to new record of 13.75-billion kwhr

The 1959 line of the weekly power output chart (page 11) was swept upward on a wave of demand from air conditioning and industrial plants in the week ending June 27.

Sendout total for the week was 13,749,000,000 kwhr, a new record for the industry, according to Edison Electric Institute. Previous high was Jan. 10, when 13,554,000,000 kwhr was put out.

In sections of the East, new records came in the week ending July 4. Temperatures on June 29-30 soared to 97 deg in the New York City area. Consolidated Edison Co had a new output high with 68, 648,-920 kwhr being sent out June 30. Peak that day was 3,804,000 kw or slightly below a June 10 peak.

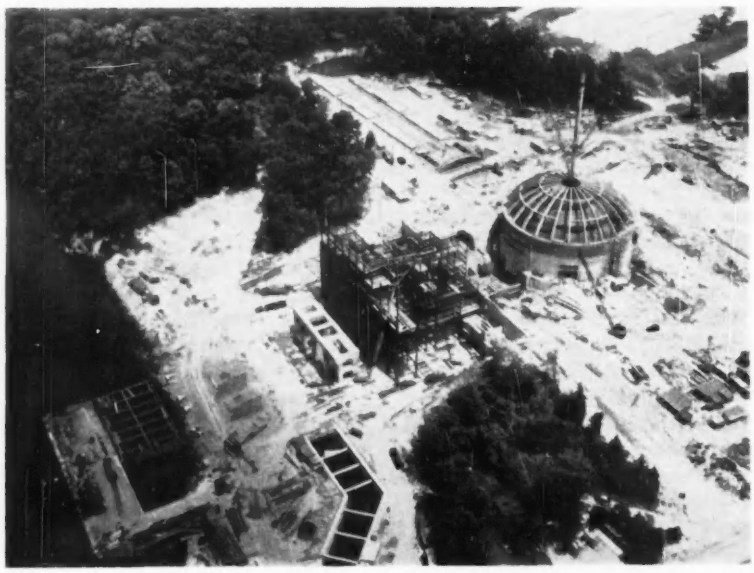
Long Island Lighting Co encountered a June 30 peak also. The 713,500 kw demand resulted in a load factor of 80%, the company said. Sendout was 13,765,000 kwhr on June 30, slightly below last winter's high.

June brought three new peaks for Public Service Electric & Gas Co. The latest and highest was on June 30 with 2,498,000 kw reported. A record sendout came that day also—45,150,400 kwhr.

Detroit Edison Co's daily output record came June 11 when air conditioning contributed to a 47,809,-000 kwhr total. Maximum load then was 2,510,000 kw, or 3.6% below the peak of last December. Industrial use totalled 132,265,000 kwhr for the week ending June 13, an increase of 28.5% over the same week of 1958, and the highest for any single week in DE's history.

Louisville Gas & Electric Co broke its record when 100-deg temperatures brought a 587,000-kw peak July 1. The day before it hit 560,000 kw.

One-fifth of Chillicothe's downtown area was without power June 28 when 93-deg temperature caused overloads. Columbus & Southern Ohio Electric Co's local manager, A. W. Jones, said line loads were shifted to lessen re-occurrence chances.



Dome Ribbing Completed at Indian Point

Concrete ribbing for the reactor building dome has been completed at Consolidated Edison Co of New York, Inc's Indian Point Station. The building will house a 160-ft dia steel sphere behind 5-ft-thick concrete walls. Meanwhile, steel is rising for two oil-fired superheaters (center) just behind the nearly completed reinforced concrete turbine pedestal. The discharge canal for the condensers can be seen at bottom of picture.

On-Site Test Checks Vessel Stress, Pressure

The first of two reactor pressure vessels for Berkeley Nuclear Power Station in Gloucester has been stress relieved and pneumatically tested on site. The vessel is 80-ft high by 50 ft dia of 3 and 4-in. thick mild steel, and weighs 1,120 tons.

After erection, welding and X-ray inspection, the vessel was heated to 650C by a network of busbars and sheathed radiant heaters suspended inside the reactor. It took two days to heat the vessel by 2 Mw obtained from the site electricity supply. Before the heat treatment began external surfaces were insulated with fiber-glass lagging to keep down heat loss.

In the 14-day cooling off period, instruments were used to measure the change of shape of the vessel. More than 300 thermocouples were used inside the reactor. Instruments were regulated from a central control room.

For the pneumatic testing, all inlets and outlets were blanked off and all apertures in the 11-ft-thick concrete biological shielding closed. Compressed air was pumped in by four 2-stage compressors at 200 psig.

Design and working pressures of the vessel are, respectively, 137 and 125 psig. The tests were at 211 psig.

John Thompson Ltd, of Great Britain, manufactured, erected and tested the reactor vessel.

Union Pulls Switch on Indiana PS Strike

After local's negotiating group and company sign new agreement memo for 4% boost, union halts bargaining

The annual contract bargaining between Public Service Co of Indiana and Local Union No. 1393 got off to a prosaic start. Meetings began March 23 and, during a period of seven weeks, 22 sessions took place in which 54 items proposed by the union on 70 points were considered.

The only hitch was in getting together on wage rates. On May 13, a compromise was reached on everything but the wage rates, then when the union proposed a 4% increase the utility agreed. The company and the union signed a memorandum of agreement which would have provided an average package hike of 12¢ an hour, or up to a $3.20-per-hour average with benefits. This was subject to ratification.

Late last month the union said it was terminating negotiations and on midnight June 30, 1,450 members of the local went out on the company's first strike in 25 years.

Supervisors Man 5 Plants

Supervisory personnel took up residence at five power plants on the system and handled problems posed by a thunderstorm last fortnight in the Southern Division. There have been no incidents or outages caused by vandalism, a company spokesman said.

The walkout poses some interesting sidelights in that recent passage of a state right-to-work law has produced an open shop situation. The utility, however, has not added any new personnel. In a letter to union employees, R. A. Gallagher, chairman of the board, said: "Any employee who desires may remain at work, and we urge you in your own, as well as the public's, best interest to do so."

Picketing was described as orderly, with other unions crossing lines. Further bargaining sessions, with the help of federal mediator Arthur R. Pearson, were expected to be resumed soon, a spokesman said early last week.

The company is prepared to operate with supervisory personnel indefinitely under normal conditions, he added. About 1,320 non-union employees are working.

Towns Sign Up for Duke Power's Contract

Over 25 communities have signed a contract first offered June 1 by Duke Power Co. The new agreement provides that the company will pay the towns a percentage of its gross receipts from residential and commercial sales of electricity. This percentage would be in lieu of all license taxes now paid by Duke.

Provisions of the contract would have meant increased payments to all incorporated towns where Duke distributes power, the company said. Duke would have the advantage of a single, uniform basis for its license payments to all towns. The maximum amount of license tax now paid by Duke and other businesses is governed by state law, and varies from town to town.

Here's the scale the towns will receive from Duke's gross revenues: 3% of the first $100,000; 2% of the next $400,000; and 1% of all over $500,000. The pacts are subject to approval by the state Public Service Commission. Payments will be made each year, based on preceding year's residential and commercial sales.

W. B. McGuire, Duke Power president, said the contract is not a franchise. It does, however, require the municipality to use Duke Power electricity for street lighting and other municipal uses. Duke will continue to pay ad valorem taxes in the communities, McGuire said.

The new type contract evolved from questions posed by town officials on whether the company could up its license tax payments to provide additional revenue for the towns. Duke began studying the matter over a year ago, McGuire said.

EW Plans 4th Electric Heating Conference

The fourth Electrical World Electric Heating and Heat Pump Conference will be held at the Chase Hotel in St. Louis, Mo., on October 21-22. The conference, heretofore held in New York City, is being moved to St. Louis with a view to getting a more representative national attendance.

The conference, as in the past, is being co-sponsored by the National Electrical Manufacturers Assn. This year it will also be sponsored by Union Electric Co.

Conference and program details are presently being worked out, and will be published as they become available.

Tacoma License Extended

Federal Power Commission has extended Tacoma City Light's license to build two Cowlitz River dams to April 1, 1965. Sports groups have fought the Mayfield and Mossyrock projects, which will cost $130 million.

Powerscope

Facts on TVA

A new booklet, "Facts About TVA Operations," gives the agency's side of controversial features of its existence: tax and in-lieu payments, coal purchasing procedures, "low" power costs and rates, and failure to show a single case where industry has been enticed by TVA to move into its service area.

The booklet claims TVA's power costs per kwhr are "less than half the average for the nation's private utilities. These costs are unaffected by taxes and interest—factors sometimes given as the reasons why rates are low in the Tennessee Valley." Most important reason for TVA's low rates, the booklet says, are the "economies" which TVA and its distributors achieve through mass production and "constant attention to keeping rates as low as possible."

For the Record

About a year from now Public Service Co of Colorado will launch a plan for processing of inactive Denver Division records at a recently completed one-story record center. The building will be fireproofed, windowless, and have metal doors. Two men will man the new center and a paper-shredding machine. "The only thing known about them is that neither will be a smoker," said PSC's News Briefs.

Exit, One Reactor Type

Recently the Atomic Energy Commission set up a program to reduce the number of reactor concepts under active development. Among the first to go is the liquid sodium-cooled, heavy water-moderated type. The suspension of research and development is indefinitely.

Originally, AEC planned to build a 10,000-ekw sodium-heavy water reactor at Anchorage but decided earlier this year against building this unproven type at such a remote non-commission site. The concept will be re-evaluated later when other reactors with sodium and heavy water technologies progress further.

A Partial Victory

Utilities in California won a partial victory in the legislature's last action on assessment practices. A proposal was turned down that would have equalized assessments between utilities and common local property, shifting an estimated $100 million in taxes from the utilities. But the lawmakers did vote to make all data on property assessments at the local level open to public inspection. This is expected to bring improved assessment practices on the local scene.

Houston L&P Gets Boost

In what may be the climax of a six-month-old fight, Houston Lighting & Power Co received city council approval of a 14.9¢ boost in its rate block for 17 kwhr minimum, and agreed to pull out about 30,000 demand meters from residences in the city. HL&P also agreed that a 1¢-per-kwhr winter rate for anything over 900 kwhr a month would be mandatory rather than optional. The changes eliminate the need for a full-scale hearing, which the company sought earlier on the council's vote for a 12¢ minimum. The compromise means a drop of gross income of $150,000 a year, HL&P said. Passage of an ordinance is required before the changes take effect.

Paducah Rejection

The city of Paducah and Kentucky Utilities Co still are negotiating the sale of KU's local facilities. In its latest offer, the company proposed to operate the system on a fee basis and sell Paducah power at wholesale rates. City representatives rejected the fee-basis idea and took no action on the rate offer.

Federal Plan Backed

The California legislature has approved a resolution asking Congress to authorize federal construction of the Trinity River project's power facilities. The state Senate, however, killed an Assembly-passed resolution which would have called upon Congress to reject the Interior Secretary's recommendation that Pacific Gas & Electric Co be permitted to construct and operate Trinity's power features.

Consultants to Aid on Site

The Los Angeles Dept of Water & Power has retained services of two consulting engineers to advise on selection of a site for a prototype nuclear power plant. The consultants will work with members of the utility's nuclear engineering group to prepare for economic use of A-plants which would supplement existing hydro and steam plants.

Dr Morris Neiburger, head of the meteorology department of UCLA, and his assistant, Dr James G. Edinger, are the consultants. They will investigate and report on "location, meteorological and environmental conditions and safety aspects of nuclear power plants," under terms of their contract.

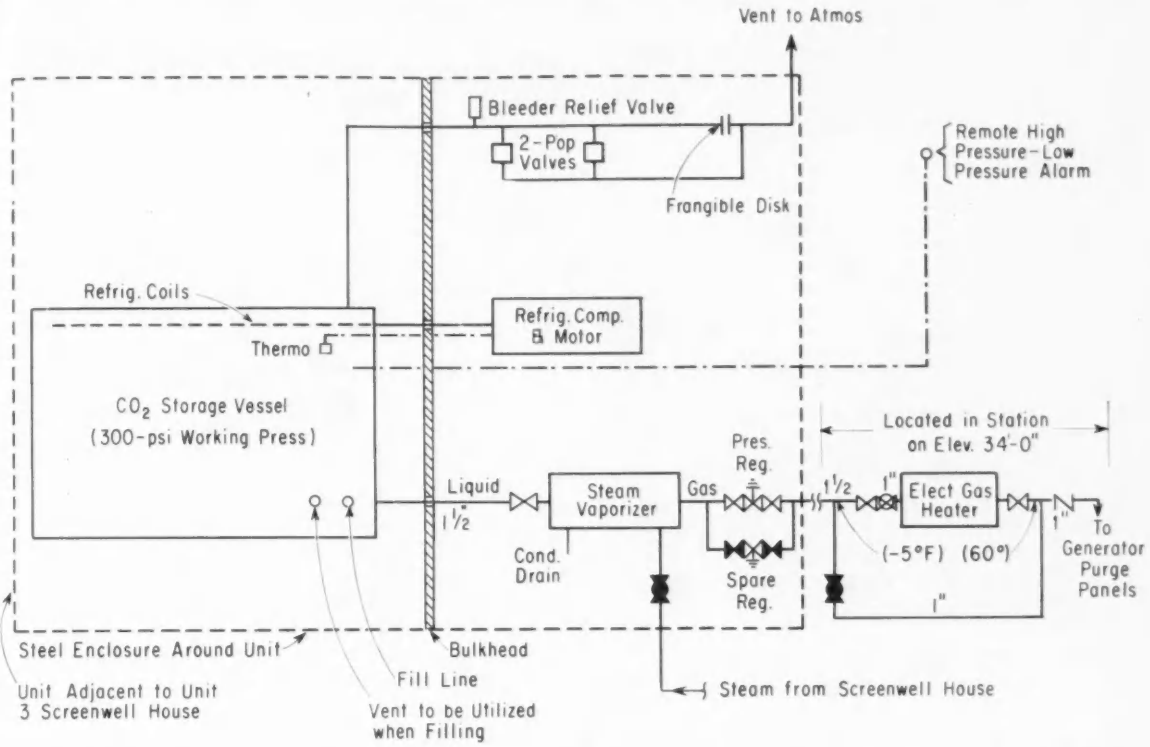
Phoenix Tries Teamwork

City engineers and members of six Phoenix, Ariz., industries have created a coordinating committee to exchange construction schedules where two or more agencies plan projects. Main purpose is to avoid installation of poles or cables in streets slated for paving or widening. Joining with the city are Arizona Public Service Co, Salt River Water Users Assn, Salt River Project, two railroads, and a telephone company.

Canada's Biggest Adds Unit

Canada's largest thermal-electric plant got a 50% boost in capacity with initial operation of a 200,000-kw unit at Ontario Hydro's Hearn Station at Toronto.

Three more units of the same size are now being installed. The Hearn plant will have total capacity of 1.2 million kw by 1960.



SCHEMATIC shows arrangement of liquid carbon dioxide installation at Con Edison's Astoria Station. Receiver can hold 4 tons, or 64,000 cu ft at atmospheric pressure. The equipment speeds turbine purging and saves on plant space

Speeds Purging of Generators

JOHN V. CLEARY JR, Assistant Engineer, Mechanical Engineering Department, Consolidated Edison Co, New York, N. Y.

A 4-ton, low-pressure, liquid carbon dioxide, bulk-storage unit, together with vaporizing and cooling equipment, was installed recently by Consolidated Edison Co of New York for purging hydrogen-filled generators at Astoria Station. Alongside the low-pressure CO_2 unit is a multiple bank of hydrogen storage cylinders. The installation is outdoors near the station within a cyclone fence enclosure with a precast concrete plank roof.

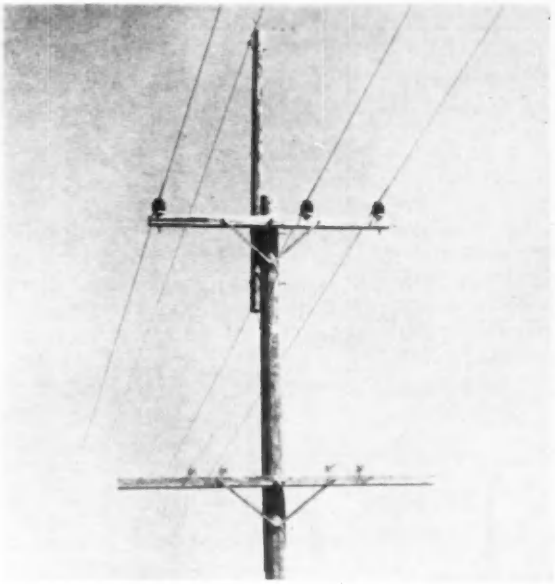
This equipment replaces the bottles and bottle-rack installations and the storage facilities for full and empty bottles formerly associated with generator purging. It constitutes a labor-saving installation in that it completely eliminates bottle handling and provides adequate CO_2 storage for purging. The unit consists of a single receiver for holding 4 tons of liquid CO_2, which is about 64,000 cu ft at atmospheric pressure.

Internal refrigeration coils keep the CO_2 liquid at 0F and 300 psi. A manually operated external steam-heated vaporizer converts the liquid to gas at 1,000 lb or 8,000 cu ft per hr. The gas flow is passed through a pressure regulator and an electric heater, which assures a gas supply to the generator of 8,000 cu ft per hr at 70 psi and a minimum temperature of 60F. This higher flow rate, made possible by the steam-heated vaporizer, halves purging time.

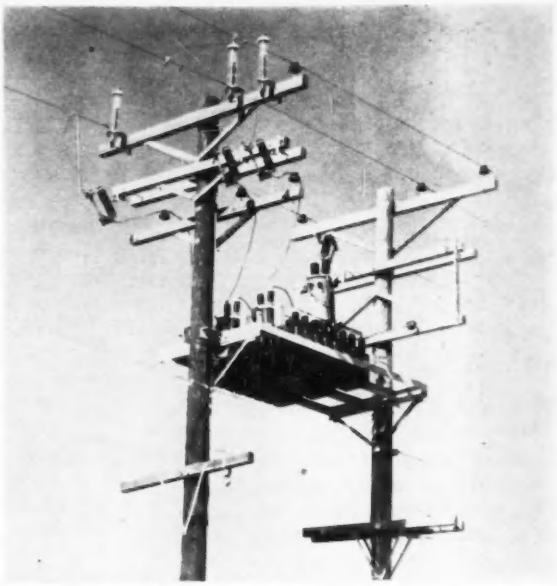
The entire equipment, except the heater, is in a space about 14 ft long by 6 ft wide and 7 ft high. The pressure vessel is covered with 4 in. of insulation with a hermetically sealed sheet steel jacket and is equipped with a bleeder relief valve to operate at 341 psi. Two pop valves are set to operate at 371 psi and a frangible disk assembly to burst at 600 psi. A remote alarm sounds when pressure rises to about 325 psi or falls below 275 psi.

As the pressure in the storage unit is controlled by the refrigerator unit, the compressor must be kept in good condition. When the refrigerator unit is inoperative, temperature and pressure are controlled through the bleeder relief valve. A reduction in pressure brings a corresponding temperature drop.

The relief valve operates 12 to 24 hr after the compressor fails which then bleeds off 1 lb of CO_2 per hr per ton stored at ambient temperature of 70F and maintains proper pressure. Should ambient temperature rise to 80F, a maximum of 2½ lb of gas is lost per hr per ton stored. Alarms warn of high or low pressure. On the front panel of the storage unit are the pressure and liquid-level gauges. Delivery of liquid CO_2 from Cardox, division of Chemetron Corp, is made by bulk trailer trucks upon request, usually on a 24-hr notice. Con Edison's experience with this equipment has prompted plans to provide installations at Arthur Kill Station and Indian Point.



NEUTRAL is in the static position in all areas of heavy lightning. Only minor changes in construction were needed



SWITCHED CAPACITORS are protected by lightning arresters and oil switches. Switches are standard 15-kv models

Lower BIL Insulates 12/20.8-Kv D

Arizona utility has up to six years experience on 300 miles of line in remote areas

T. G. WOODS, JR., Distribution Engineering Supervisor, Arizona Public Service Co, Phoenix, Ariz.

Distribution at 12/20.8 kv has appreciable economic advantages over 12-kv delta in sparsely-populated but growing areas. Almost without exception, identical equipment can be used so that, in effect, a reduced BIL is utilized. The only extra cost involved, that for the neutral and one extra step of line insulation, is repaid many times by the 67% reduction in line loss and voltage drop.

Arizona Public Service Co now has about 300 mi of multi-grounded neutral 12/20.8-kv distribution in service, some for up to six years. Experience has been so successful that planning is under way to use the 12/20.8-kv level in several new towns.

The Arizona Public Service Co service area is about 40,000 sq mi. Half the 550-Mw system peak is located in the Phoenix area, so there are large lightly populated or completely undeveloped areas. Existing distribution designs cannot economically sustain service extensions to these areas. Moreover, despite light population and load density averages, load growth has created localized high loss and excessive voltage drop problems.

In these ranchlands beyond the metropolitan districts, distribution systems have been designed for 12-kv delta operation. Use of a higher primary voltage can solve the problem only if insulation levels can be kept low enough to keep construction costs in line with 12 kv.

Because the major cost in conversion is transformer replacement, an economic gain can be realized with a voltage using the existing 12-kv (95-kv BIL) substation and distribution transformers, reconnected for wye operation. This allows conversions to be worked by temporarily grounding a corner of the delta system in the same manner that lower-voltage delta-wye conversions are made.

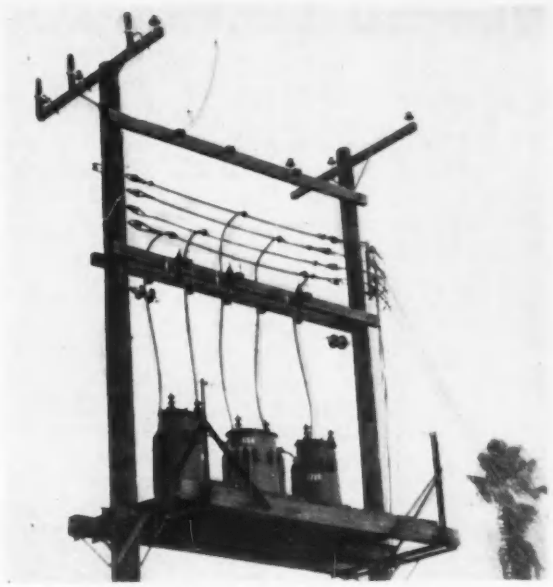
The table shows insulation levels now used with the higher-voltage system. Transformers are standard 12-kv units (95-kv BIL) connected phase-to-neutral.

The neutral is installed in static wire position in all heavy lightning areas. A line was installed without a static wire in one area in 1955, and it was not unusual in one storm to have almost 100% of the transformer fuses blow and 10% of the transformers damaged. A static wire was added, and during 1957 only four fuses were replaced.

Ground resistance varies from 10 to 600 ohms, so all poles are installed with ground wire and butt plate. Cutouts are 15-kv units and arresters are 15 kv for

Insulator Table

	Pin Type	Dead End
Light loading	55–3 (wet 35 dry 65)	single 52–4 (wet 50 dry 80)
Medium loading	55–5 (wet 45 dry 85)	double 52–4 (wet 90 dry 155)



STANDARD 12-kv clearances and construction are used for all 12/20.8-kv capacitor and transformer installations

TYPICAL SINGLE-PHASE line provides service to mountaintop CAA installation. Single-phase line uses a 4-ft arm

Distribution

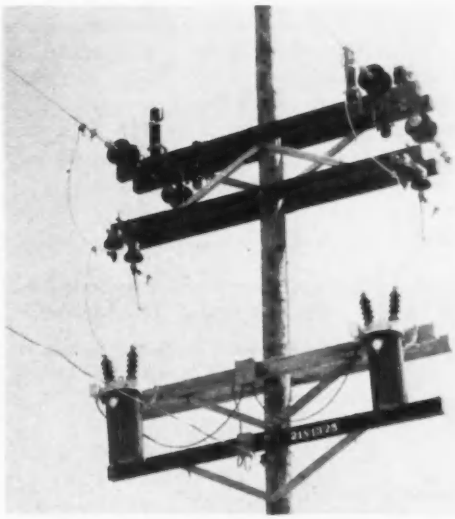
altitudes up to 5,000 ft, and 18 kv above 5,000.

Capacitors are 12,470-v units installed with a solidly grounded neutral. Lightning arresters are used on switched banks only, and standard 15-kv oil switches turn banks on and off. No special clearances or structures are required, and standard 12-kv construction is used on capacitor and transformer banks.

A standard single-phase joint-use line is shown at right. This serves a mountaintop CAA airway control installation. It also illustrates use of the neutral in the static position because of heavy lightning and critical service requirements. Lines designed for future 3-phase are provided with an 8-ft crossarm instead of the 4-ft arm.

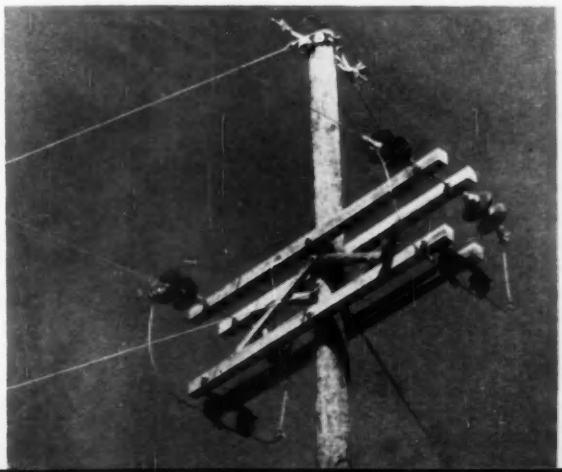
Installations under construction include a 25-mi long rural pumping circuit, a new mining town (600 homes, shopping center, etc) and three long extensions to isolated installations. Several urban areas will be converted from 2.4 to 12/20.8 kv in the near future, without taking the planned intermediate step to 7.2/12.5 kv. This is especially favorable where 22-kv subtransmission exists.

Because company policy requires all 12 kv to be worked with hot sticks, no change in construction or maintenance schedules has been required. Such safety features as load break cutouts on fixed capacitor banks and extra cross arms for cutouts or disconnects, standard for 12 kv, are satisfactory on 20.8 kv. Guys and transformer, capacitor and recloser tanks are solidly bonded. Metal parts, such as cutout hangers and steel braces, have at least 2-in. wood separation to prevent radio interference. No crossarm or pole burning has resulted in the six-year period.



RECLOSERS are now Kyle Type E single-phase, but derating standard 110-kv BIL reclosers is under consideration

DOUBLE 52-4 insulators are used to deadend in medium loading area: The disconnect switches are rated 15 kv



Consumers Power Co Tests 1,200

Load cycle testing at 100C and 500 cycles is adequate for evaluating connector ability to perform its function

D. E. **BENNETT**, Engineer, General Engineering Dept,
F. S. **RITTENHOUSE**, Assistant General Meter and Laboratory Supt, Consumers Power Co, Jackson, Mich.

Consumers Power Co has conducted a series of tests on more than 1,200 line connections, using resistance and voltage drop measurements as criteria for determining the ability of a connector to perform its function. The tests showed that load cycle testing of connectors at 100C conductor temperature and 500 cycles duration is adequate for evaluating a connection.

Fourteen makes of connectors were represented in the 1,200 contacts tested, and 80% tested satisfactorily. Tests included both bolted and compression connectors installed on copper and aluminum conductors. The tests included a series to determine the effects of short circuits. Connectors were tested on new storeroom-condition conductor without additional surface preparation.

Contact resistance may be measured either directly, as dc resistance, or by ac voltage drop. To determine contact resistance by either method, each strand of a stranded conductor must have an opportunity to carry its share of the current. To assure this, lug-type terminals were installed on the ends of all conductors.

Dc measurements were made at room temperature, using a four-terminal resistance bridge. The instrument gives a direct reading in microhms between connector and equalizer. The equalizer is used as a potential point only to avoid addition of equalizer contact resistance into the measurement.

Readings are taken from the center of the connector to the nearest edge of the equalizer. This permits analysis of both contacts. Readings are compared to published dc resistance values at 25C for the length involved. Resistance measurements are applicable to all conductor sizes but are not as readily performed as ac voltage drop measurements.

Ac voltage drop was measured, using a vacuum tube voltmeter at the specified load cycling current and at temperature equilibrium. Because the voltmeter has a high input impedance, little current is drawn through the potential pick-off points or the equalizer contact resistance. Therefore, alligator clips are suitable for temporary connections. Each connector contact was evaluated separately, as with dc resistance measurements. The combined voltage drop of contact plus conductor was compared with the voltage drop across an equal length of conductor. Reference conductor drop was previously determined by measurement of a unit length of free conductor at 100C.

Ac measurements of this type were used on 4/0 ACSR and smaller. For larger conductors, conductor reactance becomes an appreciable part of the impedance and tends to mask small changes in contact resistance. Also, at the high currents associated with conductors larger than 4/0 ACSR, the stronger magnetic field will induce a voltage in voltmeter test leads, resulting in erroneous readings. At lower currents, twisted voltmeter leads effectively counteract this. Because of these disadvantages, dc resistance measurements are used on conductor sizes larger than 4/0 ACSR.

Temperature measurements are affected by too many variables and were not used to determine connector performance. Initial and final connector temperatures were measured with a thermocouple imbedded in the connector body and were also recorded.

The criterion used to evaluate connector performance is ac voltage drop or dc resistance ratio. The ratio is defined as the ac voltage drop or dc resistance measured from the center of the connector to the equalizer on the conductor, divided by voltage drop or resistance

Table I—AC Conductor Cycling Current Necessary for An Approximate 75C Rise Over a 25C Ambient

(Small current deviations grouped for test convenience)

Conductor	Current in Amp, 60 cycle
No. 6 Solid Aluminum	83
No. 6 ACSR	93
No. 6—7 Strand Copper SD	120
No. 6 Solid Copper HD	120
No. 4 Solid Aluminum HD	120
No. 4 Solid Aluminum HD Covered	150
No. 4—7 Strand Aluminum	120
No. 4—7 Strand Aluminum Covered	150
No. 4 ACSR	125
No. 3 Solid Copper HD	175
No. 3—3 Strand Copper HD	220
No. 2—7 Strand Aluminum	150
No. 2—7 Strand Aluminum Covered	195
No. 2 ACSR	160
2F or 5/16 in. CWC	120
No. 1/0 ACSR	220
No. 1/0—7 Strand Copper HD	290
No. 3/0—7 Strand Copper HD	410
No. 3/0 ACSR	290
No. 4/0—7 Strand Copper HD	455
No. 4/0 ACSR	330
336.4 MCM 26/7 ACSR	500
350 MCM 19 Strand Aluminum	500

across an equivalent length of conductor. Consumers Power Co has adopted a maximum permissible acceptance ratio of 1.5 for a 6-in. test length and 1.2 for an 18-in. length. The ac drop and dc resistance ratio may be used interchangeably, provided the ratio does not exceed 2.0.

Analysis of the ratio criterion shows that contact resistance cannot exceed a value equal to the resistance of 3 in. of conductor. This allows connectors for small conductors to have a greater contact resistance than those for more critical large conductors.

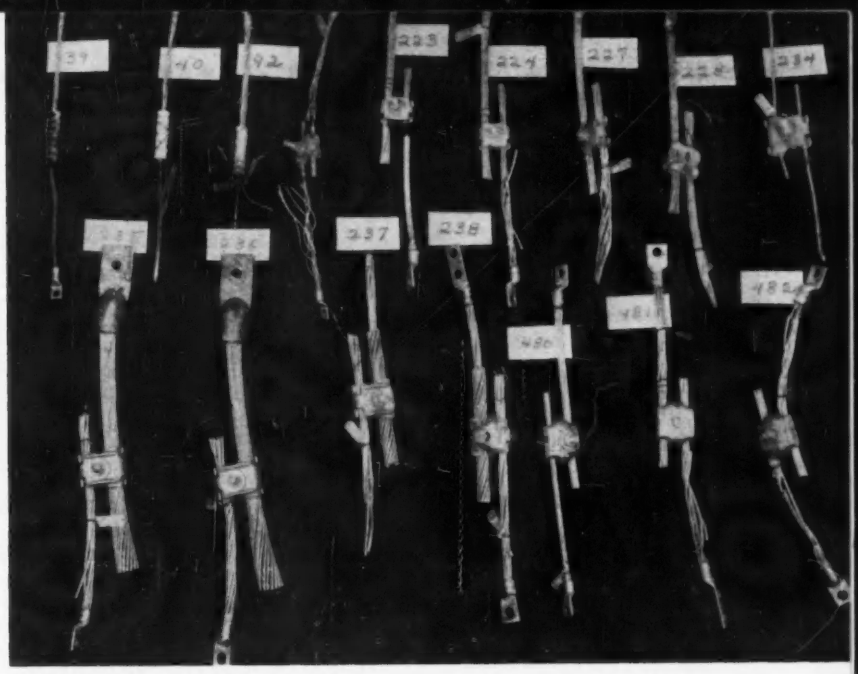
The ratio criterion includes a length of conductor external to the contact. Consideration is being given to subtracting voltage drop or resistance of this external length and thereby comparing actual resistance or voltage drop of the contact alone to an equivalent length of conductor. This modification, accompanied by changes in maximum permissible ratio limits will provide a more rigid performance standard.

Connector contact resistance must be stable throughout a 500-cycle heat cycle test. A trend showing an increase in resistance is evidence of unsatisfactory performance, even though the resistance ratio has not risen above the maximum allowable value at the end of the test. Connectors with high contact resistances are not considered satisfactory, even though the resistance is stable during the test.

Most Failures Occur Early

The 500-cycle test duration was chosen after evaluation of connectors subjected to 1,200 heat cycles. Most failures occurred prior to 400 cycles, and relatively few failures occurred between 500 and 1,200 cycles. Thus 500 cycles was chosen as a compromise.

Consumers Power Co ampacity ratings for overhead conductors are based on a conductor temperature of 100C for normal summer conditions with a 2 mph wind. For connector testing, enough current was used to bring the smallest conductor to this temperature. Lack of cooling wind in the laboratory decreased current required to about 70% of that specified for normal summer use on new overhead conductors.



CONDUCTOR DAMAGE occurred in many cases where connectors did not pass test. Duplicate tests were made in each case for verification of results

Table I shows conductor cycling currents necessary for a 75C temperature rise over a 25C ambient. Values were determined from a plot of free conductor temperature vs. current under test site conditions. Conductor temperature was measured, at a point at least 4 ft from any discontinuity, with a thermocouple soldered to an exterior conductor strand. Air circulation was kept to a minimum.

Cycle duration was sufficient to assure temperature equilibrium. Time durations specified in Table II are at least twice that necessary for normal heating and cooling.

Connectors were installed as received, with no additional application of contact aids. Manufacturers' recommendations for bolt torque or number of compressions were followed. Duplicate samples were made for each test. Where a connector was designed to cover a wide range of conductor sizes, tests were made using both minimum-to-minimum and maximum-to-maximum conductor sizes specified. If the universal features of the connector were in question, a combination involving a minimum and maximum conductor was tested.

Table II—Minimum Cycling Time

Cycling Current	On	Off
180 amp and below	45 min	45 min
180 to 240 amp	60 min	60 min
240 to 300 amp	100 min	100 min
Above 300 amp	180 min	180 min

To supplement data on connector performance with load current, tests were conducted to determine the need for including fault current tests in the evaluation.

A total of 109 connectors were subjected to high fault currents. Of the 218 contacts involved, 92 were compression connections on aluminum conductors, 49 compression on copper conductors, 70 bolted connections on aluminum conductors and 7 were bolted connections on copper conductors involving plated aluminum clamps and copper bushed grooves. In all cases, connector body material was aluminum alloy. Connectors were selected to provide wide range of contact resistances, ranging from the wire equivalent to several thousand microhms. Corresponding ac voltage drop ratios compared to 6 in. of conductor ranged from 1.0 to 42. Connectors subjected to fault currents had previously been heat cycled either to failure or for 500

(*Continued on page* 54)

Counters Aid Generator Performance

WALTER A. GREIG, Engineer and Assistant Standards Laboratory Supervisor, Detroit Edison Co, Detroit, Mich.

An instrument made from four electromagnetic counters permits accurate measurement of energy output of turbogenerators while performance tests are being made. Measurements can be taken from the generator watthour meters by power plant operating personnel.

The counters are mounted in an 8x8x13-in. sheet metal cabinet. The cabinet also contains an ac power supply to operate electrical pickup devices in the watthour meters. Each counter registers electrical pulses from the meter to which it is connected. As 12 pulses are produced per revolution, accuracy can be maintained to the nearest $\frac{1}{12}$ revolution. All counters can be started and stopped simultaneously at the beginning and end of each performance test run.

Two counters are connected to the generator output watthour meters, and the other two are connected to watthour meters measuring auxiliary energy use. The difference in readings between the two sets of counters multiplied by the proper constant gives the net generator output.

Previously, energy output of generators was measured by portable watthour meters (usually called "rotating standards") with registers which permit readings in terms of revolutions of the rotating standard disk to a small fraction of a revolution. The use of rotating standards involved a considerable amount of time. Rotating standards were calibrated for each test and were installed and removed by Meter Department personnel. It was necessary to compute correction factors for each test load.

The newer, faster system

Aerial Lift Handles Jobs Safely

Truck-mounted extensible personnel platforms with articulated and completely insulated upper boom and hydraulically-controlled basket are finding extensive use on the Philadelphia Electric Co system. New construction work, as well as maintenance work, is aided through the use of this equipment.

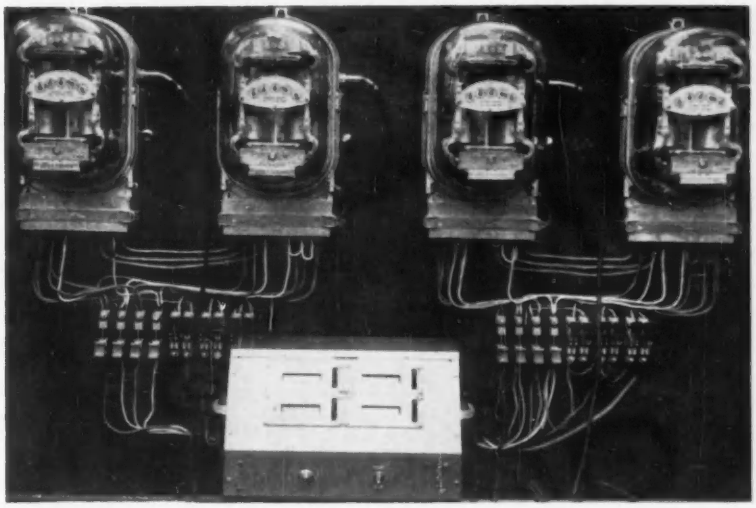
Its first application was for the replacement of faulty mid-span splices, and for this job it was a natural. Since then a great variety of tasks have been added as more or less normal assignments. Among these tasks are the installation and maintenance of aerial switches, installation and maintenance of street lighting fixtures and a great variety of trouble work, including re-fusing of transformers and line sectionalizing points. The rigs are suitable for replacement and installation of lightning arresters and cutout boxes, installation of spreaders in aerial cable, change-out of cross arms, and as a supplementary tool to speed up rubbering and the placing of running lines, particularly through trees. It is also used in maintenance of substation equipment and structures.

These rigs are equipped with compressed air that allows the use of air tools for drilling, wire brushing, and the compression of sleeves. Experience has shown that material savings can be achieved by intelligent use of the platform. With further experiment and experience, its versatility will be better appreciated and greater use can be made of it.

Testing

should improve accuracy because the same wattmeters are used for the standard at all times. Where portable test meters are used with, for example, ±1% accuracy, relative accuracy can change as much as ±2% between tests because of the possible addition of errors.

With this instrument, accurate energy measurements can be made from generator watthour meters by plant personnel in 10 or 15 min. This permits the Production Department to proceed with performance tests without planning for Meter Department participation.



LABORATORY ARRANGEMENT shows one pair of generator output watthour meters and one pair for auxiliary power measurement connected to the counter

"Flash Reports" Alert Key Personnel

ERIK N. NELSON, General Supt, System Operations, Ohio Edison Co, Akron, Ohio.

Immediate reporting of system difficulties is made to key personnel of Ohio Edison Co on a bright yellow form known as a "Flash Report." The report provides the president and top personnel in power production, system operation, and publicity with the same initial information at the same time. This practice tends to eliminate erroneous reports and rumors of what actually happened. The report also frees the system dispatcher of the task of answering telephone calls from various sources while trying to meet the difficulty.

A Flash Report is originated by the system dispatching office just as soon as a preliminary report of the difficulty can be made. It is phoned by leased wire to the general office, where a secretary types the reports and places them on the desks of key personnel. Eventualities covered by the reports include:

1. Total interruptions to service of any town or city in the operating area.
2. Partial interruptions to service covering such a wide area, or large industries, that in the judgment of the dispatcher the general office should be informed.
3. Interruptions reported over radio or television.
4. Large loss of generation by Ohio Edison or neighboring systems.

5. Dangerous weather conditions, impending or prevailing in the operating area, or in other parts of the United States, which might require emergency operation.
6. Unusual increases in peak loads.

The dispatcher has the final judgment as to whether a Flash Report should be originated. While information in the report is preliminary and is not always as accurate as in the subsequent reports, it does represent the best information available in the shortest time.

Sensing Units Read Line Icing

BPA wire sphere, strain-gauge load cell tested for remote signalling to prevent critical section ice buildup

Telemetering of ice formation and accumulation on short and particularly vulnerable transmission line sections is under test by Bonneville Power Administration. An experimental installation at Stevens Pass, Wash., where BPA's Grand Coulee-Snohomish 230-kv line crosses the Cascade range may show how to recognize trouble in time to take effective action.

BPA now uses carrier current to detect ice on important lines, although it provides only an average value for the entire line. Short, exposed sections through mountain passes can build up heavy ice before this method detects it.

There is a serious need for anticipating ice formation in vulnerable line sections, as experience shows that 2½ to 3 times as much current is required to melt ice as to prevent it. For Bonneville, this is most important because system operating limitations will not normally permit line loadings of ice-melting magnitude.

But, if incipient ice conditions are known accurately in time and operating conditions permit, load may be shifted between lines or areas to prevent ice buildup to dangerous levels. In the new method one span in each critical location would be selected to provide representative data for the area.

Two sensing elements are being tested. One is a single length of fine wire shaped into a sphere and mounted on a pole next to the conductor span. Only 2 to 3 oz of ice buildup on the wire sphere actuates a switch, signalling that icing conditions exist at the remote site.

The other is a strain-gauge-type load cell in the deadend shackle of the center phase insulator string. By measuring the strain on the string, it provides data on actual ice accumulation on the span.

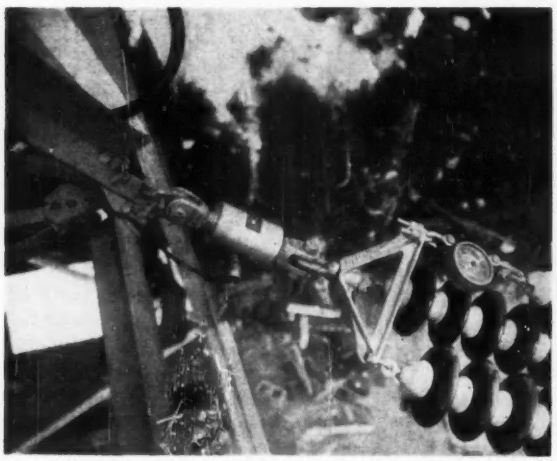
The information is telemetered to an attended substation 55 miles away by a 95-kc narrow-band carrier current transmitter. Power supply for the measuring circuits, transmitter, and for de-icing the sphere ice detector comes from a special potential device in the carrier coupling capacitor. The coupling capacitor connects to the middle phase via a plastic-imbedded expulsion fuse. Lightning protection is provided by rod gaps.

The basic measuring circuit applies the dc millivolt output of the strain-gauge load cell, proportional to conductor tension, to the telemeter transmitter. The resulting proportional subaudio frequency, in turn, frequency-modulates the carrier transmitter. At the substation the receiving equipment converts the signal back to dc voltage to position the pen of a recorder calibrated to read conductor load in pounds and inches of radial ice.

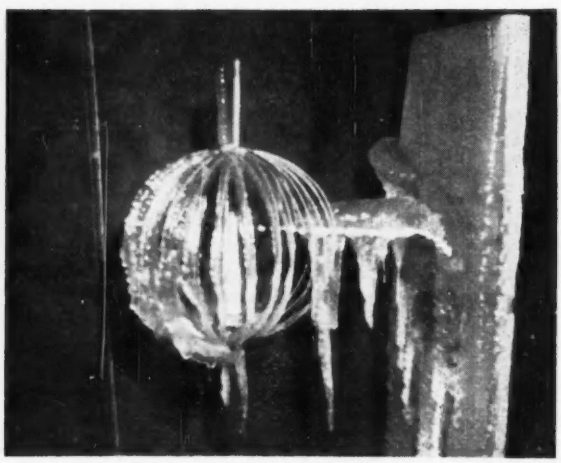
When icing begins, but before it accumulates on the conductor sufficiently to show on the recorder, the sphere ice detector switch closes, cutting off the strain-gauge signal and sending the receiving recorder to 90% full scale for 10 sec. Simultaneously, a de-icing circuit is energized from the local power supply to melt the ice from the ice detector sphere. When the sphere de-ices and the detector switch opens, the strain gauge signal is again interrupted for 10 sec to drive the receiving recorder to 10% of full scale.

A 60 mph wind at right angles to the line would increase conductor tension by the equivalent of ⅛ in. of radial ice. Wind load, however, is easily distinguished on the recorder by its characteristic variations, which appear as "painting" on the ½ in. per hr chart. Moreover, at the Stevens Pass site, winds virtually always parallel the line.

Technical difficulties with the first installation in the 1957-58 winter season prevented gathering of accurate operational data. But present operation indicates a rather complete evaluation this winter.



LOAD CELL converts transmission line tension to millivolts. During installation, test dynamometer checks calibration



WIRE SPHERE, designed for radio antenna pole in high areas, responds to 2 or 3 oz of ice accumulation

What Is Optimum R/W Width?

Rights-of-way larger than those in common use can sometimes be economically justified

T. J. ALLEN, Superintendent of Transmission, Georgia Power Co, Atlanta, Ga.

Optimum widths of rights-of-way for various voltages can be readily determined by balancing all expenses involved. Occasionally, it may be discovered that a wider right-of-way than is in use can be justified.

The annual cost of a right-of-way should include:

1. Fixed charges on capital investment in it.

2. The annual cost of keeping the right-of-way clear.

3. The average annual value of danger trees and their cutting cost.

A danger tree is a tree outside the cleared right-of-way tall enough to fall within arcing or striking distance of the line conductor.

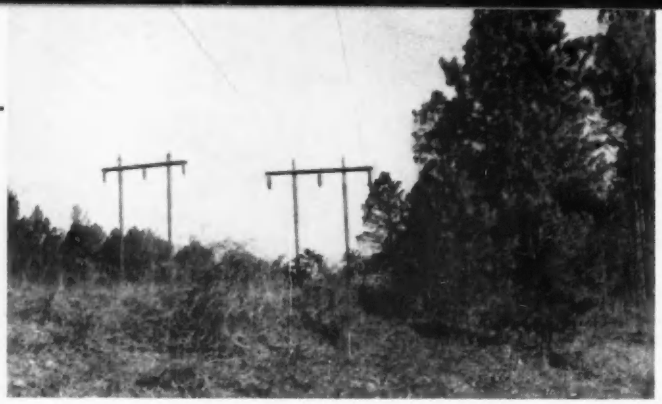
Items one and two will increase with right-of-way width, and item three will decrease with width. The most economical width will be obtained at a point where curves of these values cross.

To obtain data for the curves, the average capital investment per mile of right-of-way for 7,266 mi of transmission line was taken on the Georgia Power Co system. It was assumed that the average width was 100 ft, which amounts to 12 acres per mile. Investment is $138 per acre—$93 for easement rights and $45 for original clearing. A fixed charge of 12.25% is assessed on this investment.

The average annual right-of-way maintenance expense (less cost of cutting danger trees) for the last three years was divided by total line miles and then used as the basis of determining the annual expense of maintaining different widths. The methods used included hand cutting, grubbing, mowing, and spraying by both truck and helicopter.

Hand cutting still predominates reclearing operations. This method requires a large labor force and although power saws have reduced the number of men required, rising labor costs prompt investigation of alternate methods. Grubbing an old right-of-way where a large majority of the stumps have rotted is less expensive than original clearing. However, unless the land owner will cultivate it or maintain terraces, objectionable erosion can develop.

Mowing with brush cutters leaves a nice appearing right-of-way. It is possible that mowing will replace hand cutting of upland growth. Spraying has been generally effective on shorter brush, with helicopter applications very successful in swamps and mountainous



DANGER TREES outside cleared right-of-way are tall enough to fall within arcing or striking distance of line conductor

terrain not close to crop farms. A summary of the latest cost of the various methods of reclearing is shown in Table I.

Although Georgia Power Co easement agreements include the right to cut danger trees near the right-of-way, the policy encounters property owner resistance. As a result, only a small fraction of the danger trees have been cut. The danger tree problem can then become the governing factor in right-of-way width, and it must be determined how many danger trees can be tolerated and how much it will cost to keep them cut.

In four years (1954-57) danger trees caused 37 line failures and 127 hr of interruptions. All but two of the 37 were adjacent to 50-ft. rights-of-way, or rights-of-way where no width was specified. Records show that nearly all trees that caused line failures were being cut at the time.

Danger trees in Georgia have an economic value to the land owner. This value cannot be realized when the trees are harvested in insufficient numbers to warrant salvage as pulp wood or saw logs. Danger trees have been evaluated at a conservative $5 per cord of pulp wood, plus the cost of cutting. A conservative estimate of 400 trees per acre was used.

The total of investment and maintenance costs, as well as danger tree costs, may then be plotted against right-of-way width. The point where the curve of annual fixed charges and maintenance crosses that of value of danger trees is the most economical width.

These figures are based on the average right-of-way cost, which represents a total investment of over $12,000,000. Recent increases in right-of-way costs may result in slight reductions in economic widths.

Based on these estimates, Georgia Power Co has decided to continue using 100-ft widths for 44-and 110-kv lines. The 125 and 150-ft rights-of-way for 230-kv lines are also reasonable. The 125-ft width has been made standard for 230 kv, although the use of long spans may mean the conductor will occasionally blow off the right-of-way.

Georgia Power Co has found that a 50-ft right-of-way for 44-kv lines is inadequate and that 100 ft can be justified economically. With this greater width, subsequent increases in voltage can be accommodated on the right-of-way with substantially standard clearances.

Table I—Costs of Reclearing Rights-of-Way

	Cost Per Acre	[1] Cost Per Mile
Hand Cutting	$27	$211
Grubbing	50	392
Mechanical (mowing)	20	156
Chemical: Truck Spray	40	312
Helicopter Spray	17	133

[1] Based on a 100-ft right-of-way with 65% brush.
Annual expense, based on the above figures, is $32, $64 and $96 per mile for 50, 100 and 150-ft widths respectively.

Table II—Economic Widths of Rights-of-Way

Kv	Economic Width
44	102 ft
110	111 ft
230	130 ft

Consumers Power Co Tests 1,200 Connectors (*Continued from page* 49)

cycles. Fault currents ranged from 6,300 to 23,000 amp with time durations from 1 to 15 cycles. A total of 29 high-current tests were made with many connectors subjected to 14 consecutive faults.

Trends established were:

1. Any excessive resistance in an aluminum-to-aluminum contact was materially reduced by fault current. At 6,700 amp, as little as 2% of the time needed to damage conductors reduced excessive resistance.

2. Lower contact resistance obtained through apparent welding from fault currents is a transient condition. Nineteen tests indicate that if the connection is incapable of handling load current prior to faulting, it is also incapable of handling it after faulting, despite the apparent low resistance.

3. No adverse effect was found in aluminum connections after faulting, provided they had previously passed the 500-cycle load current test. If a connection was capable of handling load current prior to faulting, it would also handle load current afterwards.

4. Fault current has an unpredictable effect on contact resistance of aluminum compression connectors installed on copper conductors. Several connectors failed to sustain load cycling current after faulting, despite a dc resistance equivalent to the wire both before and after subjection to fault currents.

5. No connection, despite its resistance, failed on fault currents below the damage point of the smallest conductor to which it was applied.

6. If a connection is to handle load after faulting, the resistance ratio should not exceed 1.0 for copper or 2.2 for aluminum.

Change hats
with your maintenance man . . .

You'll find out, with . . .

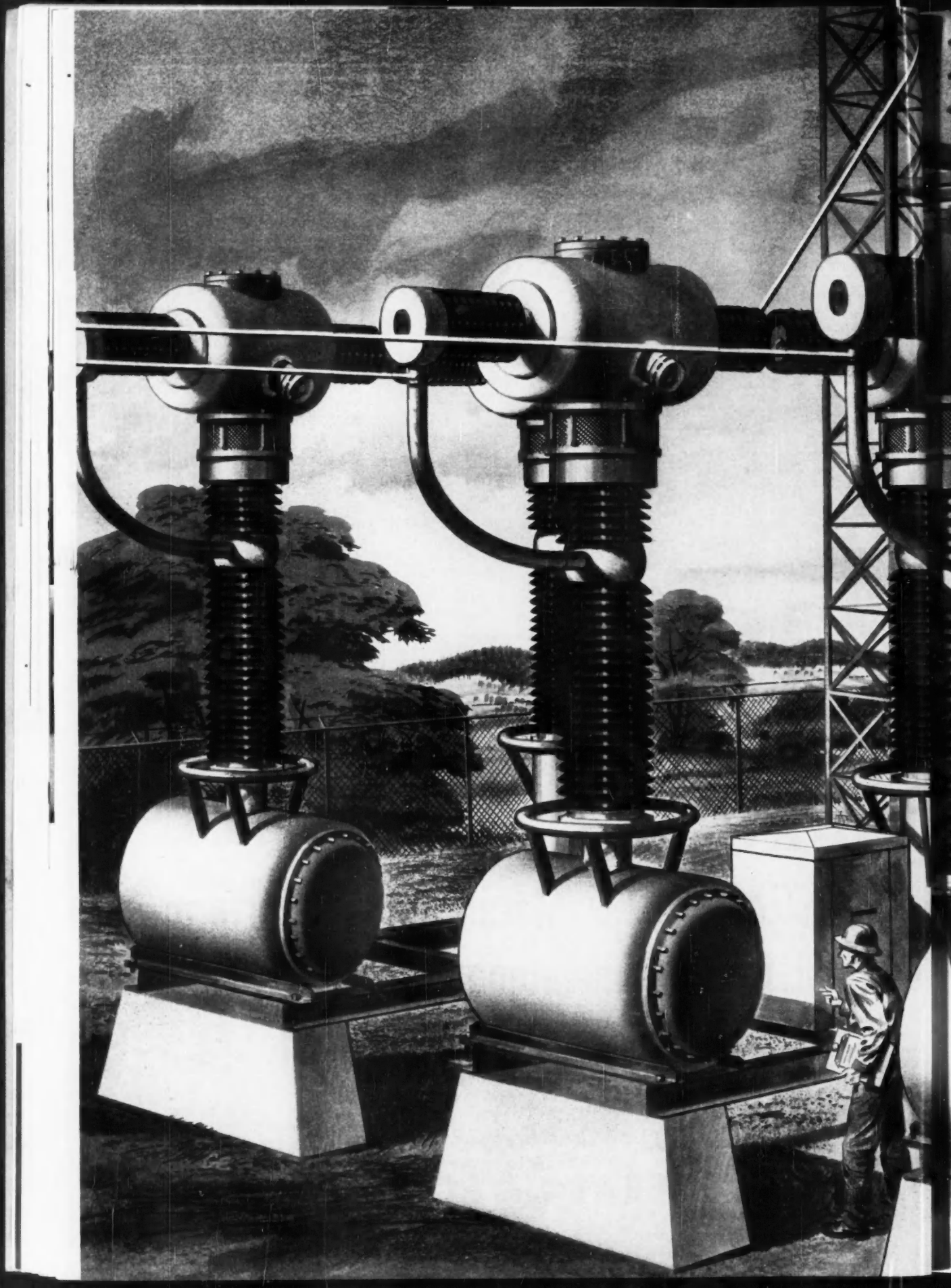
Vertical Lift Metal-clad you perform normal breaker maintenance in 20 minutes

Ask your maintenance man which make of metal-clad switchgear is easiest and quickest to maintain, and it's an odds-on bet he'll tell you General Electric Vertical Lift.

He can show you why. For example, one man, in just 35 seconds, can remove the box barrier to inspect the contacts. The arc chutes do not have to be removed. In fact, he can complete routine maintenance of an entire Vertical Lift breaker in 20 minutes or less. Saving his time saves you dollars. General Electric Company, Schenectady 5, New York. 511-34

Progress Is Our Most Important Product

GENERAL ELECTRIC



NEW General Electric AIR BLAST Power Circuit Breakers offer you . . .

• 75% maintenance reduction
• Flexible, less costly installation
• Practical super-voltage protection

General Electric's new Type ATB Air Blast Power Circuit Breakers offer you economies never possible with oil breakers. For instance, Type ATB breakers require maintenance only about one-third as often, and cut inspection time 75% when they do. Time saving of this magnitude permits you to re-evaluate the need for stand-by breakers, perhaps even eliminate certain by-pass circuits.

Installation Costs Slashed

Easier, more flexible, less costly installation is another inherent benefit of General Electric's new Air Blast design. Units are 30 to 50% lighter than comparably rated oil breakers, and, since they do not produce impact loading during interruption, they can be installed on switch structures or even on top of buildings to save space. When breakers are conventionally mounted, foundation piers are considerably smaller.

The Key to Super Voltage Transmission

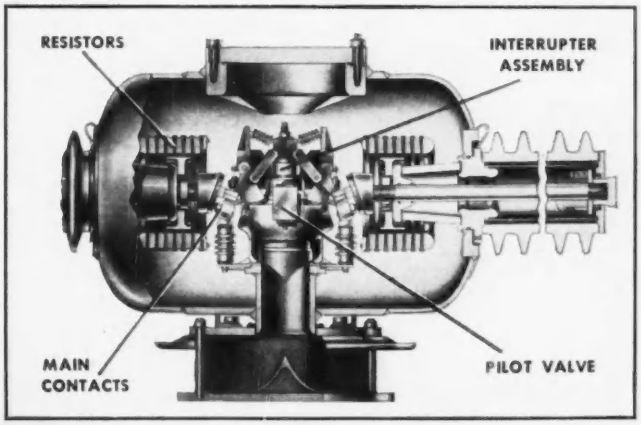
Air Blast breakers of any conceivable transmission voltage rating can now be built, removing a major stumbling block in the way of super-voltage transmission.

The key to increased breaker voltages is a new modular interrupter head which stores high-pressure air, ready for use the instant the contacts part. Ratings above 115-kv are built by simply adding interrupter heads in series. This modular design permits mass production techniques; ultimately will be reflected in lower first costs.

Type ATB breakers are available now in ratings from 115- through 460-kv and beyond. Ask your General Electric Sales Engineer to tell you about all the outstanding benefits these breakers provide. General Electric Company, Schenectady 5, New York. 494-1

Progress Is Our Most Important Product

GENERAL ELECTRIC



MODULAR INTERRUPTER HEAD is utilized in all ratings of Air Blast line. High-pressure air is stored right at the contacts, provides interruption in three cycles or less.

ROUTINE INSPECTION of Type ATB Breakers is quick and easy. Swinging aside interrupter access cover exposes contacts.

Mount Transformers in Cluster Safely

DAN H. WARD, Distribution Engineering Section, American Electric Power Service Corp, New York, N. Y.

Pole mounting of three distribution transformers in a cluster requires careful selection of pole sizes used. To select a pole with a reasonable degree of certainty as to its strength, and yet avoid the expense of overdesigning, it is first necessay to determine the maximum vertical loading which a pole of a given height and class can safely withstand.

The safe load limits here include (a) adequate margin for safety, (b) allowances for variation in pole strength, (c) bends in the pole, and (d) effects of wind against the transformers. Studies were based on Southern Yellow Pine and Douglas Fir poles having dimensions given in ASA specifications and using standard pole setting depths. Provision was also made for safe loading of Western Red Cedar poles.

Calculating a safe load limit requires assigning realistic values to stresses on the pole. The 7,400 psi ultimate fiber stress in bending (flexural) was de-rated to 6,000 psi for variations in pole strength. To the compressive load of the three transformers an extra 4,000 lb was added. Of this, 3,000 lb allows for the vertical component of guy tension, if present, and another 1,000 lb accounts for the weight of transformer devices and the vertical component of the loaded line conductor tension.

A safety factor of 5 was used for both flexure and compression in developing the tables. The National Electrical Safety Code only requires a safety factor of 2 when poles are installed and 1.33 at replacement, for Class C construction.

After transformers have been installed for some time, tall heavily loaded unguyed poles may tend to lean in the direction of the eccentric transformer due to compression of the wall of the pole hole. To help overcome this condition the pole may be raked away from the eccentric transformer a maximum of 2 in. per 10 ft of pole length and the conductors tied tightly.

MAXIMUM ALLOWABLE WEIGHT OF THREE TRANSFORMERS CLUSTER MOUNTED ON A SINGLE POLE

POLE LENGTH FEET	MOUNTING DISTANCE FROM POLE TOP FEET	POLE CLASS 1	2	3	4	5	6
		MAXIMUM WEIGHT OF THREE TRANSFORMERS-LBS ON SOUTHERN PINE OR DOUGLAS FIR POLES ONLY					
30	5	9350	6950	5200	3400	2300	1700
	7	10700	8600	6500	4350	3050	2050
35	5	8700	6200	4600	2800	1800	1150
	7	9600	7800	5600	3700	2400	1550
40	5	7300	5450	3600	2200	1300	750
	7	8700	6500	4500	2750	1700	1050
	9	10100	7650	5550	3400	2100	1300
45	5	6250	4350	2800	1600	900	500
	7	7500	5550	3300	2200	1450	950
	9	8650	6650	4450	2900	1900	1200
50	5	5350	3450	2150	1200	700	400
	7	6700	4400	2700	1800	1200	800
	9	7800	5000	3500	2250	1450	950

TABLE I. MAXIMUM WEIGHT is for three single-phase transformers cluster-mounted 90 deg apart on a single pole. Center transformer is mounted in line with primary. Mounting distance is from top of pole to center line of top mounting bracket. All weights are based on standard pole setting depths in soil. Where weight of center transformer is more than weights of others, use the class of pole that will carry three transformers of the greater weight. For one transformer or regulator, divide Table I weights by 2. Exception: for 30 ft poles, divide by 2.4. For Western Red Cedar poles, divide Table I weights by 1.35

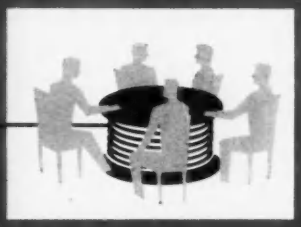
SAFE SOIL BEARING LOAD FOR THREE TRANSFORMERS ON A SINGLE POLE

POLE CLASS	DIAMETER OF CONCRETE PAD UNDER POLE (IF REQUIRED)	MAX ALLOWABLE WEIGHT OF THREE TRANSFORMERS-LBS TYPE OF SOIL: SOFT CLAY	WET OR FIRM CLAY / SAND AND CLAY MIXED	FINE DRY SAND	HARD DRY CLAY / COARSE SAND	GRAVEL	HARD PAN / ROCK
35 FT POLE							
5	NO PAD	0	0	210	1350	3600	5700
4		0	0	480	1800	4200	6600
3		0	0	1050	2500	5400	8400
2		0	0	1500	3150	6600	9900
1		0	0	2000	3750	7500	11400
4 (MIN)	18"	0	3300	6600	10200	10200+	11400+
3 (MIN)	30"	6000	15000+				
45 FT POLE							
5	NO PAD	0	0	300	1500	3900	6300
4		0	0	750	2100	4800	7800
3		0	0	1200	2850	6000	9300
2		0	0	1650	3600	7200	11000
1		0	0	2100	4200	8400	11000+
4 (MIN)	18"	0	2850	6300	9900	9900+	11000+
3 (MIN)	30"	5700	15000+				
45 FT AND TALLER POLES							
5	NO PAD	0	0	390	1650	4200	6900
4		0	0	900	2400	5400	8700
3		0	0	1350	3150	6600	10200
2		0	0	1950	3900	8100	10200+
1		0	0	2400	4500	9300	10200+
4 (MIN)	18"	0	2550	6000	9600	10200+	
3 (MIN)	30"	5400	15000+				

TABLE II. ALLOWABLE LOAD also depends on soil, as shown here. Table gives maximum weight in lb. Use crib bracing, where required, for soft soils such as clay or sand. Where 12-in. thick concrete pads are required, measure standard setting depth from top of pad to ground line

DUPONT

WIRE AND CABLE ROUND TABLE



We don't make wire and cable, but...

. . . we have a vital interest in the industry for two reasons: (1) Du Pont produces materials for wire and cable insulation and jackets, and (2) we also use miles and miles of finished cable in our own plants and buildings.

What does this mean to you? It means we're concerned with improving products from the standpoint of the raw-material supplier and *user*.

In our labs, there is constant study of plastic materials and their properties. And many times our engineers are called into the field to help solve specific problems and to suggest where a thermoplastic resin might do the job better. With the data gained from this laboratory and field work, we design and install cable in our own plants for service experience.

If you would like to know more about Du Pont's experience as a wire and cable user, write Room 177A, Advertising Department, E. I. du Pont de Nemours & Co. (Inc.), Wilmington 98, Del.

For advice on the design of your specific cable, consult your wire and cable supplier.

POLYCHEMICALS DEPARTMENT

DUPONT

Better Things for Better Living . . . *through Chemistry*

ALATHON® POLYETHYLENE RESINS | **RULAN®** FLAME-RETARDANT PLASTICS | **ZYTEL®** NYLON RESINS

Procurement & Products

OUTLOOK ▶ **Resentment against inflation is growing political force.** Public concern about declining value of the dollar is believed by Washington sources to be nearing record peak. Note that the Administration is stepping up its anti-inflation efforts. These efforts seem pointed toward putting the inflation issue smack in the middle of next year's presidential campaign. Meanwhile, watch for Congress to squash attempts to up the minimum wage and cut standard work week.

FOREIGN BUYING ▶ **Many purchasing agents shy away from foreign buying,** a recent survey by the National Association of Purchasing Agents indicates. Results indicate 39% are not making any foreign purchases; 30% are buying more than they did five years ago; 29% are buying about the same; and 2% are buying less.

A large group of the pa's are adamant in their belief that foreign buying should be avoided because of its possible adverse effect on domestic production and economy. Others look to price tags and to efforts to retard inflation.

HANDLING ▶ **Items displayed at the recent materials handling show** in Cleveland included several designed to make better use of warehouse space and increase worker productivity. Here are a few:

New lift trucks that operate in six or seven-foot aisles. Nearly every maker had one either side loading type or specially designed reach truck.

Compact truck-mounted battery chargers practical for trucks used in single shift operation.

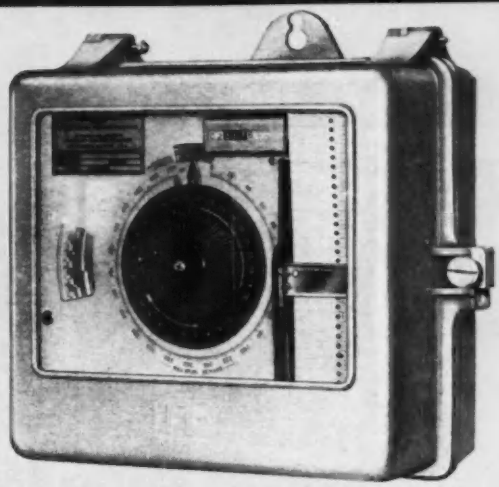
ORGANIZATION ▶ **Decentralization of purchasing departments is** trend in all industries. A study by McGraw-Hill's Purchasing Week shows that 82% of the respondents to a questionnaire have decentralized purchasing operations since 1926. However, as most respondents having decentralization are in industries producing a wide variety of products, their reasons for decentralization are not applicable to utilities.

Weaknesses of decentralization, as turned up by the study, deserve consideration. Among the weaknesses are: Lack of control if procedures are not organized properly, loss of standardization of efficiencies, loss of quantity discounts, duplication of effort, and delayed delivery due to additional paperwork.

News of Manufacturers ..... page 64

New Equipment ..... page 70

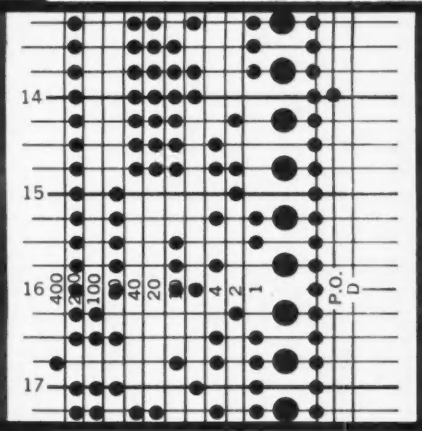
Readers Service ..... page 72



Convert demand load data to IBM cards for quicker load analysis—accurate billing

The new, improved Sangamo-FP digital demand recorder facilitates automatic data processing . . . can be used for all demand recording purposes . . . includes Kw, Kvar and Kva values.

You get more for your money in load survey applications—twice as many impulses per interval . . . faster translating . . . plus a visible record that lets you see peaks and outages right after they occur! Sangamo's automatic translator permits direct, accurate and economical conversion of tape data to standard IBM cards. It can be used with your present key punch equipment, or you can obtain fast translating service from Sangamo at a nominal cost.



SANGAMO-FP DIGITAL DEMAND RECORDERS

GIVE *A VISUAL* RECORD . . .

PICK THE PEAK and READ IT!

The enlarged section of tape above shows how simple it is . . . See the punch farthest to the left at 16¾ hours? Read it. 400 plus 10 plus 4 plus 1—415. A quick glance at the right hand of the tape shows a power outage at 14 hours. The punched tape provides a permanent, *positive* record that eliminates arbitrary interpretation of charts.

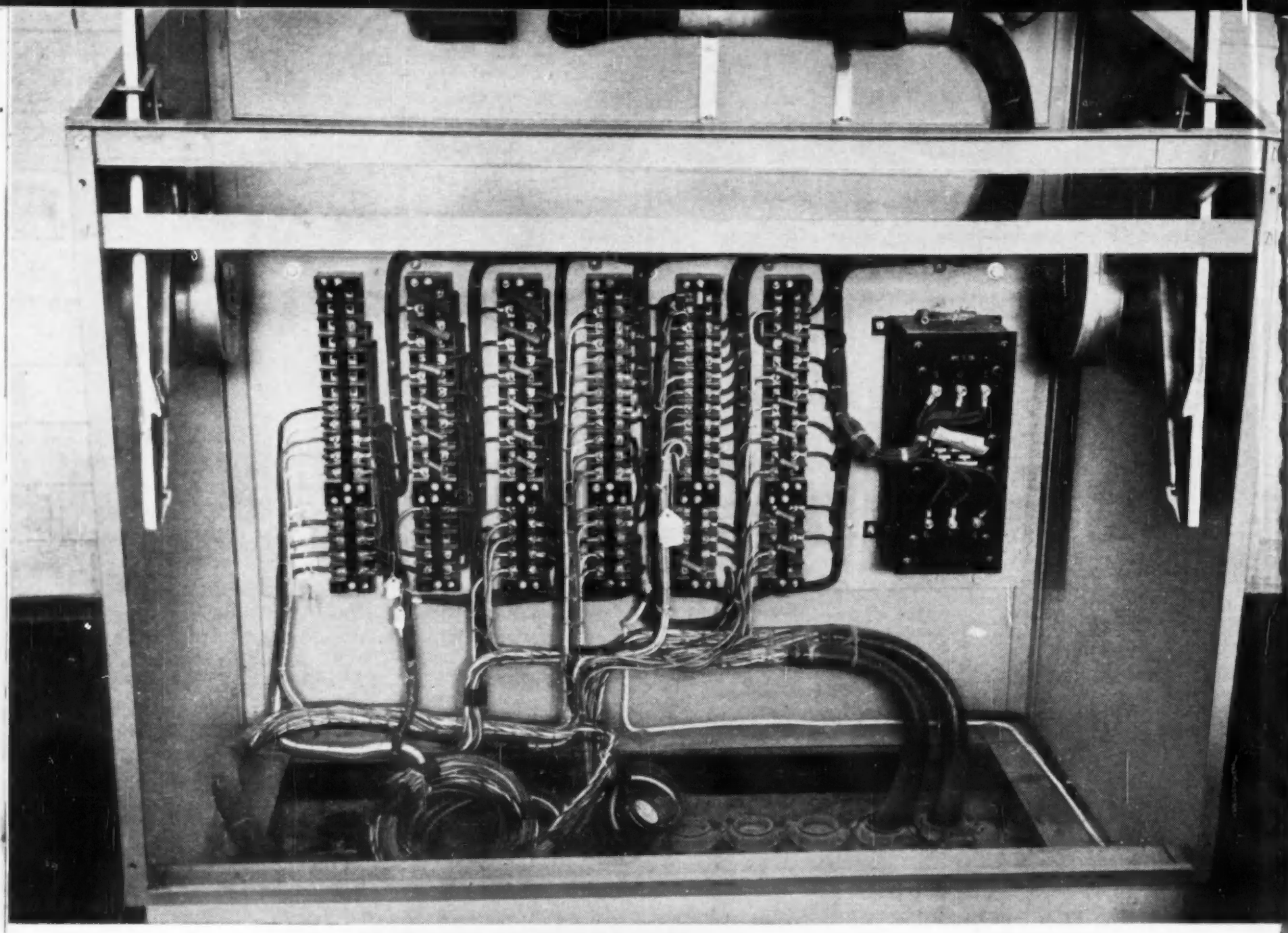
The DDR is available for 5, 15, 30 and 60 minute intervals—easily converts from one interval to another. A single roll of tape (15 minute interval) permits 3 months of continuous recording *yet allows monthly record removal*. Get the complete story from your Sangamo Representative or write for Bulletin 360.

SANGAMO Electric Company

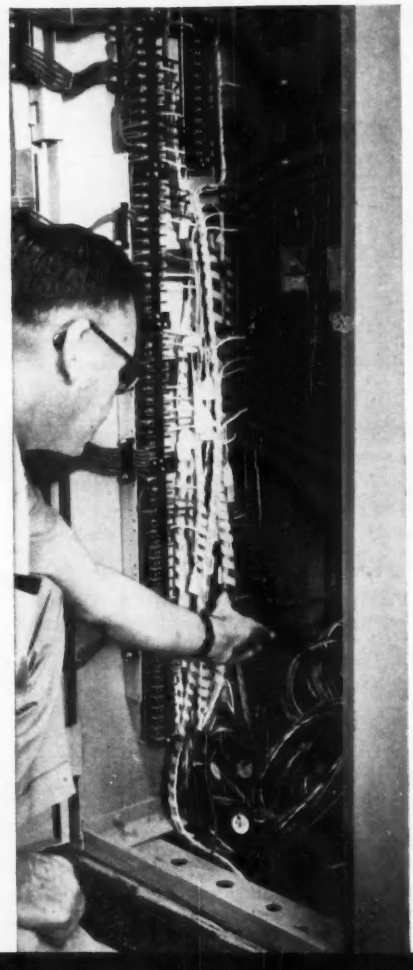
SPRINGFIELD, ILLINOIS

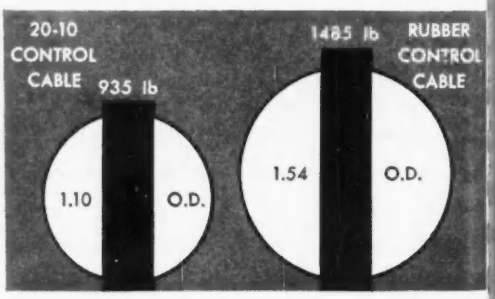
50TH ANNIVERSARY SANGAMO 1909-1959

SM59-3



Jobs like this are made simpler from start to finish with Anaconda 20-10 Control Cable. All wiring shown in the control desk of a 15,000 hp motor is Anaconda 20-10 Control Cable.





Comparison of O.D. and Weight per 1,000 Feet of No. 10 Awg 19 Conductor Cable. Ease of installation is inversely proportional to the weight and diameter of the cable. This comparison shows 20-10 to be lighter in weight and smaller in diameter than a conventional rubber control cable. Thus Anaconda 20-10 Control Cable saves on installation costs.

Anaconda 20-10 Control Cable's composite design takes full advantage of both polyethylene and Densheath, giving full IPCEA recommended insulation thickness of 30 mils for 600-volt service.

ANACONDA'S SUPERIOR 20-10 THERMOPLASTIC CONTROL CABLE SIMPLIFIES CABLE NEEDS!

ONE CABLE for practically all 600-volt control cable applications – that's Anaconda's versatile, new thermoplastic 20-10 Control Cable. This means simplification of all your control cable needs – makes ordering, stocking, and installation easier, quicker, and more economical.

Conductors are insulated with 20 mils of polyethylene and covered with 10 mils of Densheath® (PVC). This composite design takes full advantage of the best features of both thermoplastics, and provides full IPCEA recommended insulation thickness of 30 mils for 600-volt service.

POLYETHYLENE conductor insulation provides:

high dielectric strength
low moisture absorption
low power factor
protection against electro-endosmosis
high insulation resistance
low specific inductive capacity
ozone resistance
resistance to chemical attack

DENSHEATH (PVC), as both insulation and covering, provides:

good dielectric properties
excellent flame resistance
excellent coloring ability
excellent abrasion resistance

The application of the over-all Densheath jacket to the cabled composite insulated and covered conductors provides a product that can be installed aerially . . . in conduits . . . in trays or ducts . . . directly buried. Anaconda 20-10, then, is the superior control cable that can offer all the benefits of standardization to industry.

For 1000-volt service, Anaconda has adapted 20-10's design to produce a cable with 30 mils of polyethylene and 15 mils of Densheath (PVC).

Talk to the Man from Anaconda about 20-10, or 30-15, control cables for your applications. And be sure to write for Bulletin DM-5844 for the full technical data on Anaconda 20-10 Control Cable. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

59201

See the man from

ANACONDA®

for 20-10 thermoplastic control cable

Use this coupon to get your copy of an important New Booklet on
ANACONDA 20-10 CONTROL CABLE
full technical data

Anaconda Wire & Cable Company
25 Broadway
New York 4, New York

GENTLEMEN:

Please send me a copy of Bulletin DM-5844 containing full technical information on Anaconda 20-10 Thermoplastic Control Cable.

Name .....

Company .....

Address .....

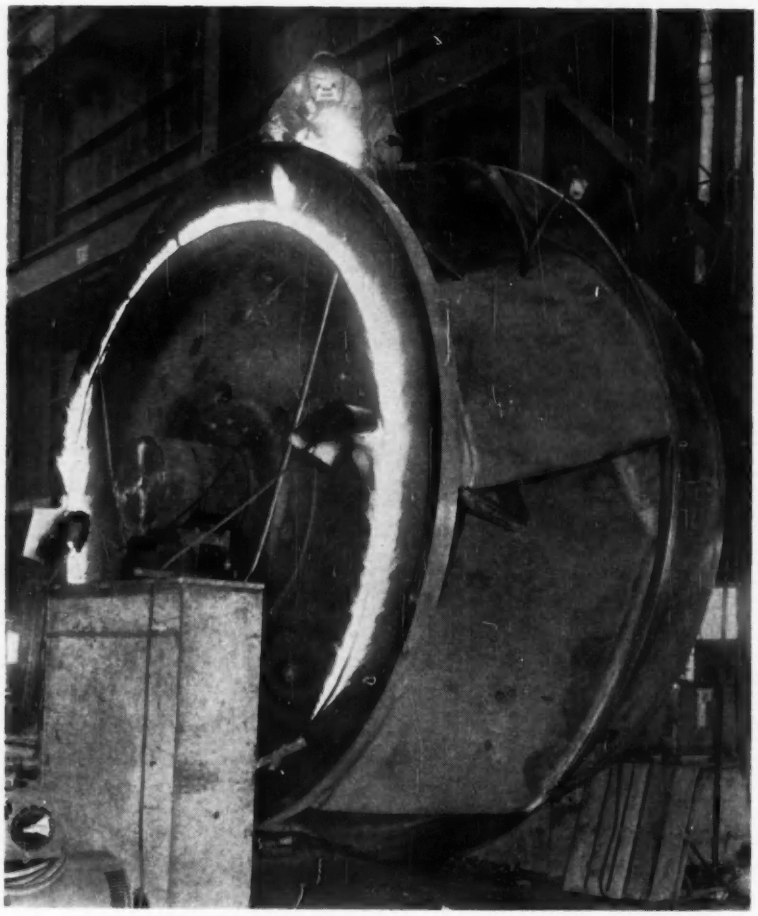
City ..... **Zone** ..... **State** .....

B & W Introduces Welded Carbon Steel Tubing

A new line of welded steel tubing has been placed on the market by Babcock & Wilcox's tubular products division. Designed to replace seamless carbon steel heat exchanger tubing, the new tubing is applicable in boilers, condensers, reheaters and superheaters. The "Lectrosonic" carbon steel tubing will operate under pressures as high as 2700 psi and at the same temperatures as its seamless counterpart.

Prices for the new tubing show savings of 10% to 32% over the seamless variety. B&W says that five years of extensive field tests have proven the new tubing equal to or superior to the seamless heat exchanger tubing.

"Lectrosonic" tubing is made to ASTM Specifications A-214 and A-334 Grade C and identical ASME Specifications. It is available in a complete range of sizes through 4½-in. OD, and in all standard wall thicknesses.



Around-the-Clock Preheat Used by A-C

Around-the-clock preheating process is used by Allis-Chalmers in fabricating reversible pump-turbines for the New York State Power Authority's Tuscarora plant. Shown above, vanes are welded to the crown of the impeller runner, with ring of flames used to pre-heat until weld is completed. This reduces moisture and safeguards against cracking.

The 12 pump-turbines for the Tuscarora plant will provide greater combined capacities as motor-driven pumps and hydraulic turbine-driven generators than any other pump-turbine plant in the world.

Each unit, as a 37,500-hp motor-driven pump, will deliver 3400 cu ft/min against a storage pond head of 85 feet. In reverse rotation, each unit will become a 25,000-kva, 8-pf generating unit.

Another Aluminum Tower Project Is Built by Alcoa

Twenty all-aluminum towers for Philadelphia Electric's double-circuit 220-kv transmission line will be manufactured by Aluminum Co of America. This line will be a normal working one, not an experimental line project.

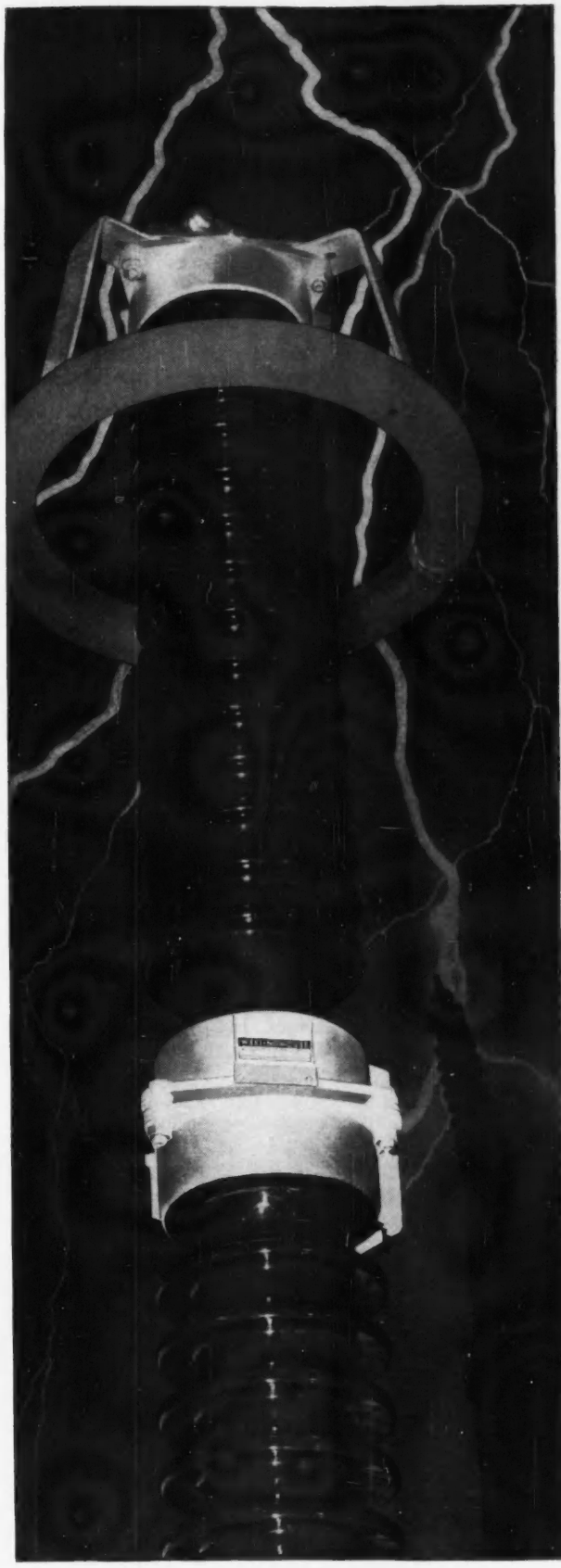
The utility expects delivery of the first tower this summer and plans to put the line into service by mid-'60. The new "supercritical" Eddystone generating station will be served by the line, and it will be an additional link in the 10,000-Mw interconnection between utilities in Pennsylvania, Maryland, and New Jersey. It will be part of the line interconnecting Philadelphia Electric at Chichester, Pa., Public Service at Gloucester, N. J., and Atlantic City Electric at Mickleton, N. J.

Light-Weight Capacitor Developed by GE

A new lighter, smaller 50-kvar capacitor has been introduced by General Electric. Called the "Isokraft 50", the new capacitor weighs about 99 lbs and is the first 50-kvar unit to weigh less than 2 lbs per kvar.

Development of a new dielectric paper, designated "Isokraft" paper, helped make the new capacitor pos-

(*Continued on page* 66)



New Intermediate Type IVS Arrester Gives Proven Protection Against Severest Strokes

The experience of 37 years of valve arrester design and field application has made possible the new IVS intermediate class arrester with station arrester dependability. Incorporating many established Westinghouse LVS and station-type arrester features, the IVS is rated from 3 to 121 kv and offers high surge capacity in excess of 100,000 amps!

Bonus Value Features

Higher Creepage Values With Stronger Porcelain

The new deep-dish skirts have up to 35% additional creepage, providing greater protection against the effects of contamination. 15% stronger porcelain housing has been made possible by a high-strength glaze that gives much greater cantilever strength. Self-supporting installations can therefore withstand many times the normal wind loading.

Station-Type Mobilarc Gaps

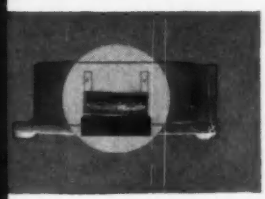
Time-proven, heavy-duty, station-type Mobilarc* gap elements spin the arc over the electrode, eliminating pitting and other damage . . . a plus value in this intermediate arrester line.

Entire Arrester Hermetically Sealed

Gap and valve elements are enclosed in a wet-process porcelain casing which is solder-sealed at both ends by the Westinghouse-patented process of soldering metal to porcelain. This positively eliminates entrance of moisture which would cause corrosion or radio interference.

Ask your Westinghouse sales engineer to demonstrate the Bonus Values of the IVS arrester, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-60976

*Trade-Mark



Pressure Release . . . In the remote event of a sustained, 60-cycle current flow through the arrester, the lead diaphragm pressure release operates, permitting the pressure to be vented. Pressure blows off the red cover plate, thus giving visual indication that the arrester should be replaced.

YOU CAN BE **SURE**... IF IT'S

Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL DESI ARNAZ SHOWS" CBS TV MONDAYS

CHANCE

K&T Fuse Links

can be used with any distribution cutout on the market

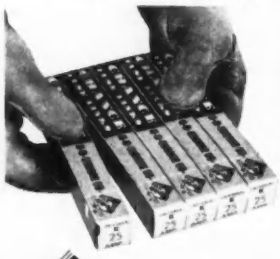
Quality control tests make certain that Chance Fuse Links meet standard requirements.

Precision-made to EEI-NEMA Interchangeability Standards

Chance K (fast) or T (slow) fuse links are available in three styles—Universal Buttonhead, Open-Link, and Universal style with removable buttonheads and cable adapters.

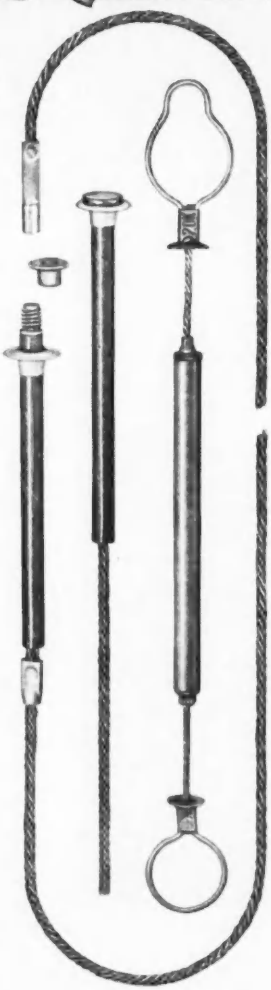
The fusible elements of these fast or slow fuse links have the consistent melting characteristics needed to give dependable performance in any distribution cutout at all values of fault current. Each individual strand of the copper cable leads is lead-coated for maximum resistance to corrosion.

Write for "Fuse Links and How to Use Them," a free manual on fuse link application and coordination.



Packaged for *EASY* removal

A slight twist separates a single link container from the 5 unit pack. Perforated end on single container allows link to be taken out easily — even with lineman's gloved hands. Type and rating are clearly marked on both ends of each box.



ABC INDUSTRIES

A. B. CHANCE CO.

CENTRALIA, MISSOURI

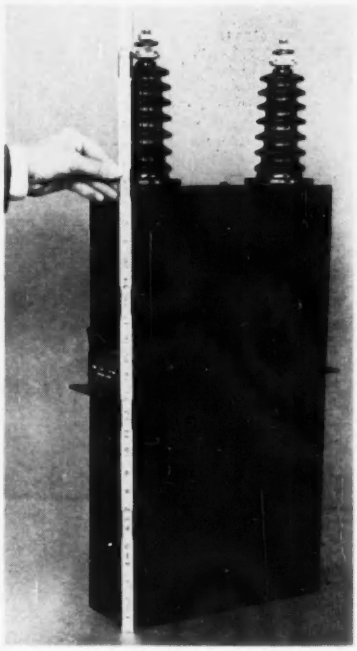
A. B. Chance Co. of Canada, Ltd., Toronto

CF59-18

GE's Lt. Weight Capacitor

(*Continued from page* 64)

sible, says GE. Superior characteristics which increase the thermal stability and improve reliability and life are claimed for the new paper by GE. The increase in thermal



stability is due to a lower and flatter curve of watts loss versus temperature.

Easier, less expensive capacitor installations are possible because of the significant weight reduction. In addition, 600-kvar installations are now possible on poles previously limited by weight to 450 kvar.

Three More Firms Added to Project EHV

Three more firms have become cooperators in Project EHV, GE's experimental extra-high-voltage power line.

Anchor Metals will supply two steel towers for the 4½-mile 750,000-v line.

Petersen Engineering will provide tension stringing equipment to hoist the heavy conductors (steel-rein-

(*Continued on page* 68)

Naugatuck PARACRIL OZO

The oil-resistant, ozone-resistant nitrile rubber

Now! lasting **COLORS** in rubber wire jackets

A development of Naugatuck research makes it possible to combine in a vulcanized rubber wire jacket all these properties:

- Excellent resistance to ozone and outdoor "weathering"
- Outstanding heat resistance
- High abrasion resistance
- Excellent oil, grease and chemical resistance
- Fast CV extrusion

...**PLUS PERMANENT BRIGHT COLORS**

In addition to the suggested uses, you will think of dozens of other applications where wire jacketing with all these properties can serve either an aesthetic or utilitarian purpose.

One of Naugatuck's technical representatives will be happy to discuss with any prospective user the formulation of the Paracril® Ozo compound which makes possible this combination of properties... not only in wire jacketing but also in shoe soles, hose jackets, weather stripping and other vulcanized rubber products.

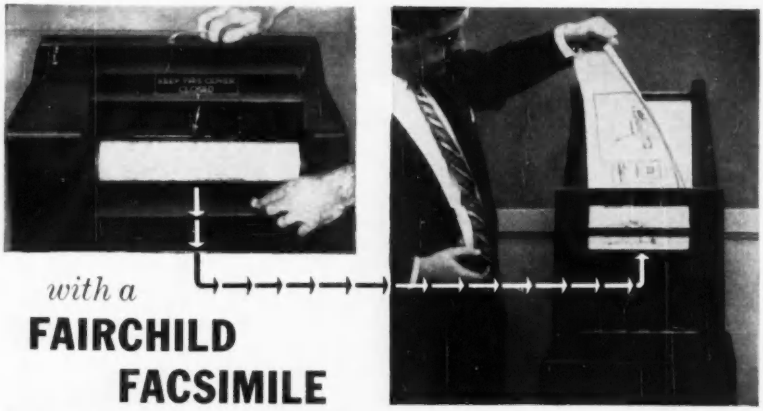
Naugatuck Chemical

Division of United States Rubber Company

713P Elm Street
Naugatuck, Connecticut

Rubber Chemicals • Synthetic Rubber • Plastics • Agricultural Chemicals • Reclaimed Rubber • Latices • CANADA: Naugatuck Chemicals Division, Dominion Rubber Co., Ltd., Elmira, Ontario • CABLE: Rubexport, N. Y.

transmit **ANY** *data* **ANY** *distance*



with a

FAIRCHILD FACSIMILE COMMUNICATION SYSTEM

• *in minutes* • *without error* • *in sharp detail*

Now you can break the time barrier—intra-plant or coast-to-coast—of interchanging any kind of visual data in volume. With a Fairchild facsimile communication system, planned to serve your specific needs, you can transmit engineering drawings, change orders, blueprints, charts, sketches, memos, schedules, specifications, photos, contracts, invoices, shipping orders, forms, letters. You can use short wave radio, telephone, leased wire or microwave transmission. You can transmit data rapidly and dependably, without error, and with the sharpest detail available today.

Electric-utility applications

Electric power companies can increase the return on their microwave equipment, already used for such services as voice telephony, telemetering, supervisory control, load-frequency control, and protective relaying. With Fairchild Facsimile, microwave can also be used to transmit data-logging reports, photos and maps, centralized bookkeeping and billing data, engineering drawings, etc. The recording paper used, translucent and lightweight, makes an excellent original for any diazo-type office copier.

Nationwide service

Operation? Just attach the copy, set the scanner, press a button, and in less than 6 minutes transmission is completed at the receiving end. Reliability? It has served the demanding needs of the newspaper industry for over 20 years. Service? Fairchild offers an established nationwide organization, unequalled in this field, that includes 56 experienced service specialists. Cost? An attractive lease arrangement covers preventive maintenance, periodic equipment updating, and replacement options as improved models are developed. For full information, mail coupon now for brochure "To Deliver the Facts...Fast."

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Fairchild Camera and Instrument Corporation
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Title_____

Company_____

Street_____

City_____ Zone____ State_____

More Firms Join Project EHV

(*Continued from page* 66)

forced aluminum cables) up to the points where they are suspended from the towers, as well as to adjust their sag and tension.

Brewer-Tichener will supply special hardware fittings for the line, including corona shields, conductor clamps, and yoke plates.

Other previously-announced cooperating companies include: Western Massachusetts Electric for power supply and system operation; Stone and Webster for line design and construction; Alcoa for conductors, bus, lightning spires, substation structures, and one aluminum tower; American Bridge division of US Steel for steel towers; Rilco Laminated Products and Weyerhaeuser Timber for laminated wood tower.

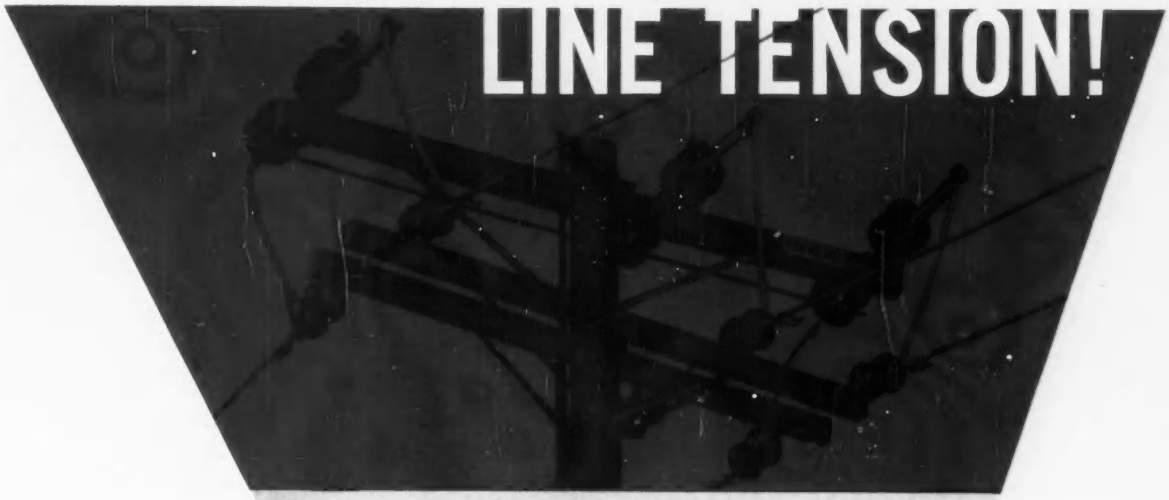
MANUFACTURERS BRIEFS

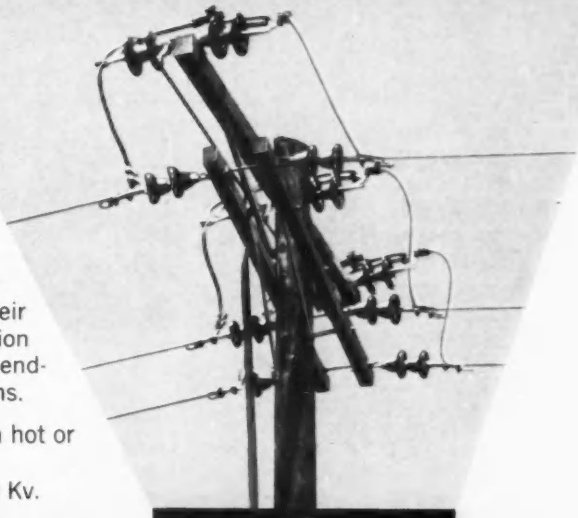
Westinghouse is using plastic-coated distribution transformer covers and cover hardware on all pole-type units with cover-mounted bushings, 5 through 333 kva. The coating is on the main and handhole covers, the eye bolt and handhole bolt to provide adequate insulation protection against line-lockout from birds and squirrels. The covers are corrosion and abrasion resistant.

General Cable starts construction this month of a $2.5 to $3 million wire and cable plant at Quincy, Michigan. The 60,000-sq-ft building will be finished next February . . . **S&C Electric** breaks ground this summer for a new engineering research building adjacent to its Chicago plant . . . **General Electric** shifts its atomic products division headquarters from Schenectady, N. Y. to Palo Alto, Calif., to bring headquarters' activities closer to department operations. Since the Knolls Atomic Power Laboratory was transferred to the turbine division, the atomic products div has had no operating departments in Schenectady.

Merger of **Anchor Metals** and **D. S. Kennedy & Co** is being negotiated, with Anchor as an operating division.

INSTALL KPF SWITCHES WITH OR WITHOUT LINE TENSION!





KPF air break switches operate equally well with or without conductor tension—tension is not necessary to their smooth functioning. Thus KPF switches may be installed on angle poles, major crossings or other locations where separate deadends are desired. Further, their simple design eliminates lubrication or maintenance, and insures dependability under all weather conditions.

KPF switches may be installed on hot or dead lines, and are available for common voltages from 7.5 to 110 Kv.

Test KPF switches with an installation on your own system. Inquire now!

KPF ELECTRIC COMPANY

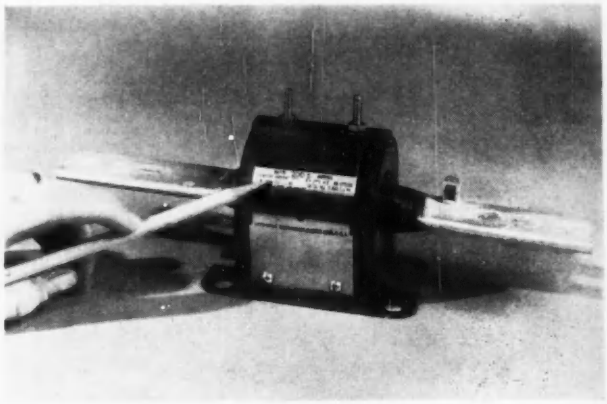
KPF
AIR BREAK SWITCHES
Standard for half a century

P.O. Box 1257E
Stockton, California
HOward 4-8381

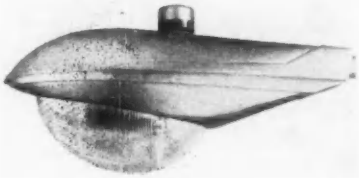
5571

(For further information refer to Reader Service Card on page 72)

Current Transformer . . .

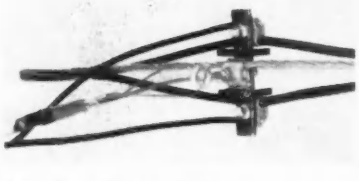


. . . **for indoor use** in low-voltage metering applications reduces costs. A savings of one-third can result when this low-cost unit is used where more expensive weather-resistant molded transformers are not required. The Type RT is designed for 600-v service, and can be supplied in current ratings of 200/5 or 400/5 amp. Both ratings are within the 0.3 accuracy class.
Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.



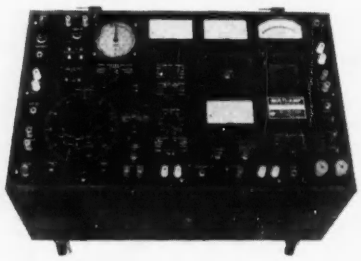
Luminaires . . .

. . . **in a new line of mercury-vapor units** are now available. The Type M luminaires are furnished in three basic units: M-250 (175 or 250 w), M-400 (400 w), and M-1000 (700 or 1,000 w). Receptacles are available on all units for a cadmium sulphide photoelectric control. The on-off light level may be set externally with a screw adjustment on the underside of the base.
General Electric Co, Schenectady 5, N. Y.



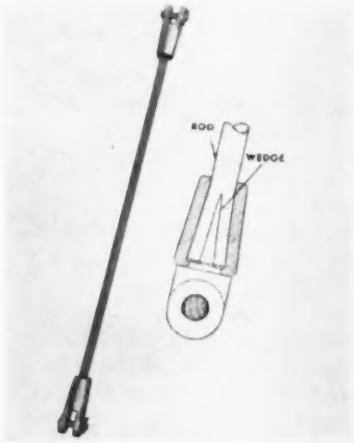
Service Take-Off . . .

. . . **for Triplex or parallel wire span** will take No. 6W to 2/0 ACSR inclusive in either groove. Wires are on 2¼-in. centers, separated by "Permali", a laminated plastic with excellent dielectric properties. Water will drip clear of conductors. Strain of service wires is not on connectors, but on eye bolt anchoring neutral. It is known as No. 33.
Husted Electrical Mfg Co, Gibsonia, Pa.



Relay Tester . . .

. . . **features three metered current sources.** Known as Model IDR-35/MT-1, the unit tests a full range of ac current and voltage-activated relays, plus circuit breakers, current transformers and insulation resistance. One metered current source is a reactor circuit available for general relay testing; the second is an auxiliary for differential relays; and the third is dc for target and seal-in relays.
Multi-Amp Corp, 465 Lehigh Ave, Union, N. J.



Guy-Strain Insulator . . .

. . . **line features 25,000-lb ultimate strength** rating. The fiberglass insulators are available in pin-to-pin lengths of 43¼, 62¼ and 86¼ in. The wedge principle is employed in the mechanical assembly of the malleable-iron sockets and fiberglass rods. The insulators give excellent rain-washing action, require no arcing horns, and are undamaged by birds, insects or rot.
A. B. Chance Co, Centralia, Mo.

Portable Voltmeter . . .

. . . **measures positive and negative peaks** to 150 kv dc and rms

(*Continued on page* 75)

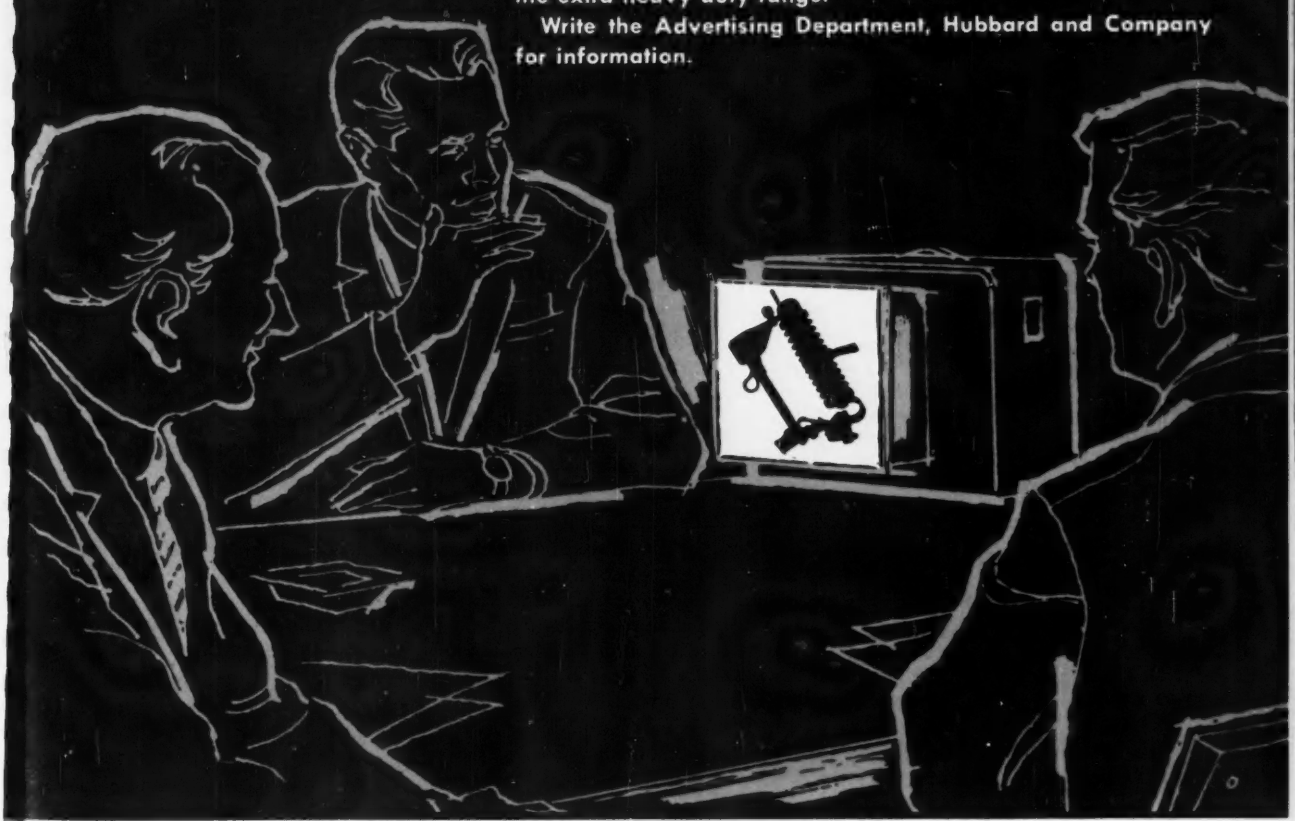
SEE AND HEAR
the dramatic story of
SINGLE-VENT SMALL-BORE
CUTOUT OPERATION

See the new 16mm sound and color movie "The Hubbard EHD Faultmaster" right from your own desk chair. Film time: ten minutes.

Watch the Hubbard EHD Cutout clear faults throughout the range without "null operating points"—see closure on a fault, dramatizing conclusively the *positive protection* and *safe operation* provided by the Single-Vent Small-Bore fuse cutout.

Through the use of ultra slow-motion photography, you see the fuse link melt right before your eyes...you see gases generated within the fuse tube and discharged downward and away in a single confined cone—eliminating the possibility of damage to overhead construction. You see the results of research leading to the industry's first Single-Vent Small-Bore Cutout in the extra heavy duty range.

Write the Advertising Department, Hubbard and Company for information.



No screen is needed, no threading, no rewind, no darkened room. Just plug it in and watch. Filmed at the Hubbard Electrical Research and Development Laboratory.

HUBBARD

AND COMPANY · 200 SOUTH MICHIGAN AVENUE · CHICAGO 4, ILLINOIS

Readers Service

For additional information on new products, supplies, and services in this issue, the Manufacturers Editor of Electrical World offers his facilities. Check items in which you are interested in list below:

NEW EQUIPMENT

Westinghouse .....Transformer ☐
GE .....Luminaires ☐
Husted .....Service Take-Off ☐
Multi-Amp .....Tester ☐
Chance .....Insulator ☐
Associated Research ...Voltmeter ☐
Malleable Iron .....Guy Hook ☐
American Electric .....Bracket ☐

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Trial ..... ☐
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JULY 13, 1959

LGP-30

ROYAL PRECISION

Electronic digital computer permits load-flow calculations on networks of up to 100 busses and 270 lines at lowest cost

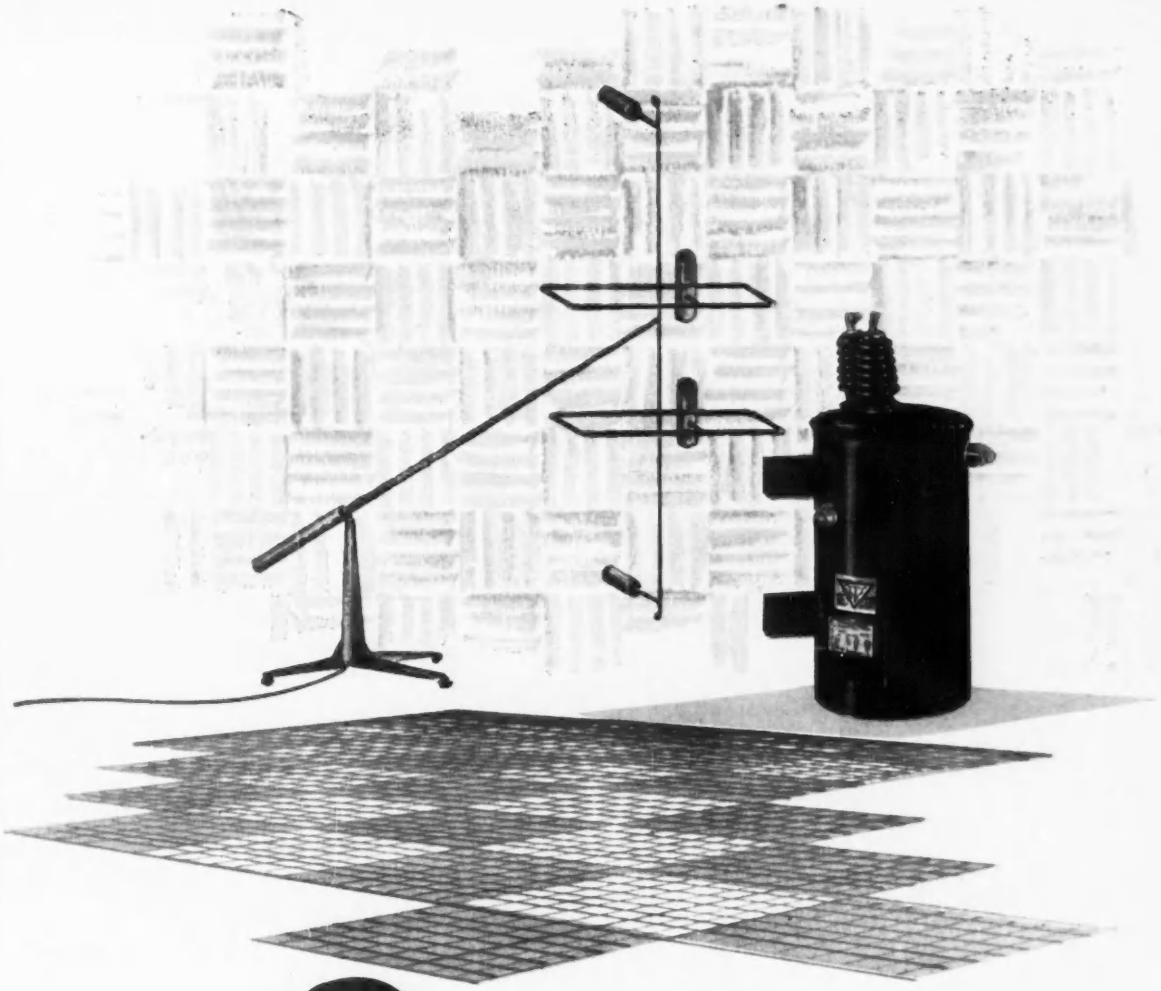
Gives you optimum level efficiency in production, sales, purchase!

The lowest-priced complete computer you can buy, the versatile LGP-30 saves you time and money by 1) economically solving your load-flow problems; 2) forecasting optimum turbine-generator and boiler usage under varying conditions of system demand; 3) optimizing purchase and sales of power.

Now at work serving numerous electrical utilities, the compact, mobile LGP-30 operates from any convenient wall outlet . . . requires no expensive air-conditioning or installation. It gives you twice the capacity of any computer in its class, yet is by far the easiest to program in basic machine language.

Internal components of the LGP-30 have been greatly reduced to insure highest reliability. Operation has been remarkably simplified. Your personnel are quickly trained by Royal McBee without charge. Sub-routines and programs are available – as well as membership in an active users organization. Sales and service facilities are maintained coast-to-coast. For further information and specifications, write Royal McBee Corporation, Data Processing Division, Port Chester, N.Y. In Canada: The McBee Company, Ltd., 179 Bartley Drive, Toronto 16.

ROYAL McBEE • *data processing division*



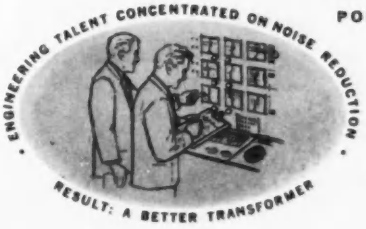
QUIET transformers assure satisfied customers. More-than-ordinary quietness is another outstanding feature of RT&E transformers. Normal noise is hushed, for full transformer life, by a unique core-clamping method that isolates the core and minimizes the transmission of sound vibration to the tank. By this method, operating noise is reduced to a point far below maximum db levels being considered by NEMA as standard for distribution transformers.

More proof that you buy more than just another transformer when you buy from RT&E.

RT&E CORPORATION

WAUKESHA, WISCONSIN

PORTLAND, OREGON



FF

Introducing
a new Corporation

AEROTEC INDUSTRIES, INC.
Greenwich, Conn.

To better serve power plants, aviation and general industry ...four fast-growing corporations merge July 1, 1959

Prat-Daniel Corporation (Established 1924), The Thermix Corporation (1941), The Aerotec Corporation (1942) and The Aerotherm Corporation (1950) are known and respected internationally for their engineering and manufacturing skills.

On July 1 they formed a new, integrated corporation, Aerotec Industries, Inc. — having carefully studied the advantages of centralizing management and consolidating their financial and manufacturing resources. Management of the new organization remains in the hands of the experienced executives of the merging companies.

The new Aerotec Industries, Inc. has three divisions:

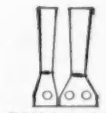
The **Industrial Division** engineers, manufactures and sells electrical precipitators and mechanical dust collectors for flyash and industrial applications, as well as air preheaters, curtain dampers, blowers and fan-stacks. Its facilities include a plant in Greenwich, Conn., and the Prat-Daniel plant in South Norwalk, Conn.

The **Aircraft Equipment Division,** Greenwich, Conn., designs, produces and sells a wide range of controls for aircraft, missiles and nuclear applications.

The **Aerotherm Division,** Bantam, Conn., develops, fabricates and sells aircraft seating and accessories.

An expanded and intensified program is now underway to accelerate research, new developments and technical advances that will benefit you. If you have any problems or requirements in the above fields our engineers are ready to help solve them.

Write Aerotec Industries, Inc., Dept.-L, Greenwich, Conn.


FAN-STACKS

AIR PREHEATERS

CURTAIN DAMPERS

MECHANICAL DUST COLLECTORS

INTEGRAL DUST COLLECTORS

ELECTRICAL PRECIPITATORS

SERIES DUST COLLECTORS

GAS SCRUBBERS

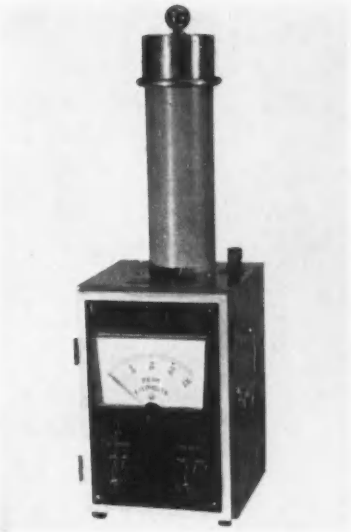
BLOWERS

AIRCRAFT CONTROLS

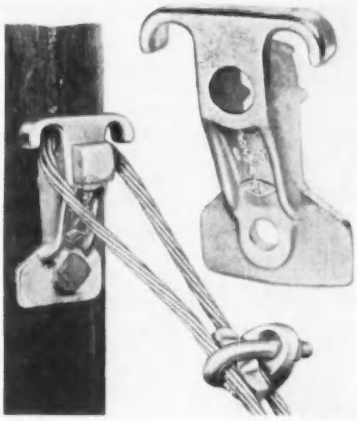
AIRCRAFT SEATS

Portable Voltmeter . . .

(*Continued from page 70*)



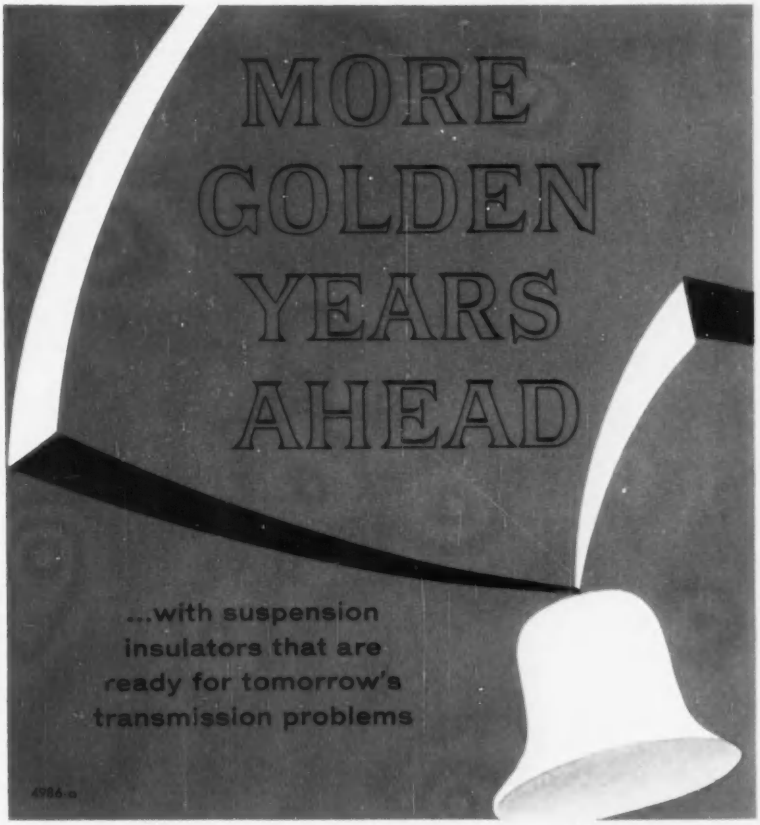
potential to 110 kv. The Series 8520 HYPOT Voltmeters are available with single or multiple ranges and with built-in high voltage multiplier bushings to full scale range of 75 kv (peak). For greater ranges, the high voltage multiplier bushing is separately mounted, with low voltage leads extending to the meter. **Associated Research, Inc, 3777 W Belmont Ave, Chicago 18, Ill.**



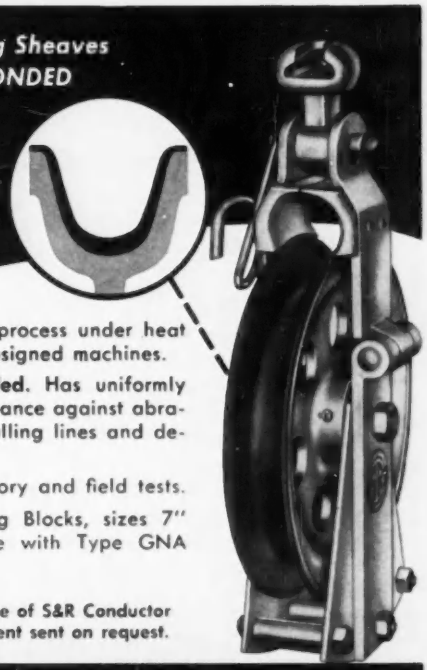
Guy Hook . . .

. . . keeps through bolt primarily in tension rather than in shear. The hook will accept all types of guy dead-ending devices from 0 to 90 deg, permitting the use of one at-

(*Continued on page 77*)



Now, Conductor Stringing Sheaves
WITH PERMANENTLY BONDED
TYPE GNA NEOPRENE LINING



Molded by a vulcanization process under heat and pressure on specially designed machines.

Lining is **permanently bonded.** Has uniformly excellent properties for resistance against abrasive wear from wire rope pulling lines and deterioration from lubricants.

Proven by extensive laboratory and field tests.

All S&R Conductor Stringing Blocks, sizes 7" through 28", are available with Type GNA Neoprene Lined Sheaves.

NEW CATALOG on complete line of S&R Conductor Stringing Equipment sent on request.

SHERMAN & REILLY, INC.
ENGINEERS AND MANUFACTURERS
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Newport News rack rakes . . . minimum-manpower way to keep water intakes free of debris

Newport News mechanical rack rakes are power-operated rakes for cleaning trash racks at water intakes, including those at hydro-electric plants, steam plants, pumping stations, and similar installations throughout this country and abroad. Under ordinary conditions, one man per shift keeps racks clean for a dozen bays.

Operate in channel guides for maximum cleaning action

A Newport News rake *won't ride over trash* nor will its teeth drop the debris, because the rake operates in channel guides for positive action. Special teeth are available for cleaning racks of filamentous algae, seaweed, etc.

The Newport News mechanical rack rake has been built to operate in bays from 5 feet 6 inches wide to 28 feet 6 inches in width. Forebay design determines the maximum width for a single rake. In the case of a very wide bay, intermediate guides are sometimes used to reduce the length of the rake. There are many typical installation arrangements to fit your needs. Newport News engineers are prepared to individualize these designs for you.

If you have a debris problem, write for a copy of THE NEWPORT NEWS MECHANICAL RACK RAKE, an illustrated booklet describing the installation, operation, and advantages of a Newport News rake.

Engineers . . . Desirable positions available at Newport News for Designers and Engineers in many categories. Address inquiries to Employment Manager.

Newport News
Shipbuilding and Dry Dock Company
Newport News, Virginia

Guy Hook . . .

(*Continued from page 75*)

tachment for both down and span guys. Channel shape of the back provides fitting to any pole diameter, and ears accept a wide range of strand diameters.
Malleable Iron Fittings Co, Branford, Conn.

Mounting Bracket . . .

. . . for photoelectric streetlight controls can be used to install control on wood poles, crossarms or building walls. The "Twist-Lock" socket will accept all controls conforming to the EEI-NEMA standard. Lead wires are No. 10 neoprene jacketed.
American Electric Mfg Corp, 3271 Chelsea Ave, Memphis, Tenn.

More New Products

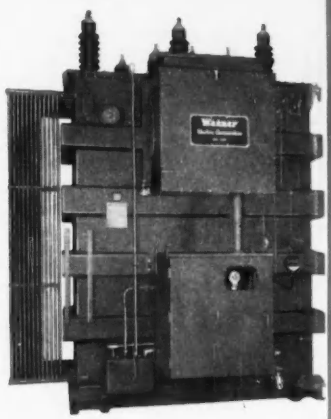
High temperature application **tape** is used in construction and repair of electrical equipment. Called Temp-R-Tape GV, it will withstand operating temperatures as high as 500F and short time exposure to 600F. —Connecticut Hard Rubber Co, 407 East St, New Haven 9, Conn.

Plastic **safety hat** has adjustable all-plastic suspension. The detachable headband fits the back of the neck snugly.—Davis Emergency Equipment Co, 45 Halleck St, Newark, N. J.

Disposable polyethylene **gloves** are strong, airtight and watertight. The Oly/Poly gloves come in a universal size.—Olympic Glove Co, Inc, 95 Madison Ave, New York 16, N. Y.

WAGNER LOAD TAP CHANGING TRANSFORMERS

offer new simplicity of design . . . new quietness of operation . . . new freedom from maintenance



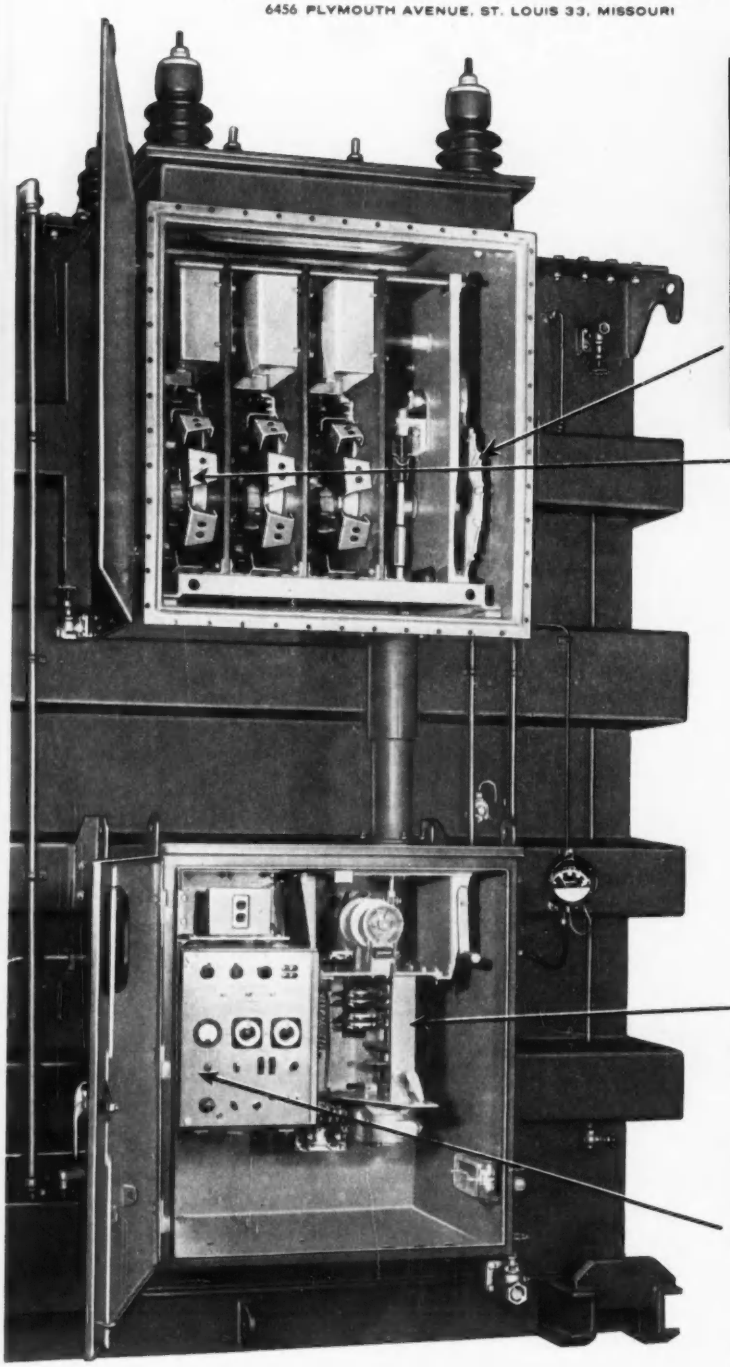
Here is a compact, extremely simple power transformer load tap changing mechanism, using a single drive shaft and one set of miter gears to assure quiet operation. Magnetic amplifier control means higher accuracy in the voltage sensing circuit, and greater reliability since no moving parts are necessary.

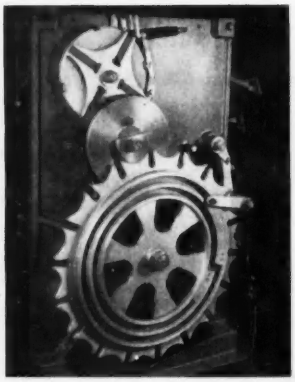
The design simplicity of the Wagner load tap changer . . . in the drive mechanism, the transmission assembly, the switches and the control circuit . . . results in long, efficient operating life with freedom from maintenance.

For full information on these Load Tap Changing Power Transformers, consult your nearby Wagner Sales Engineer. There are Wagner branches in 32 principal cities.

Wagner Electric Corporation

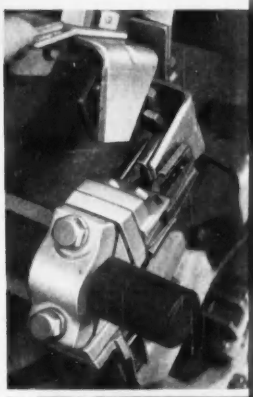
6456 PLYMOUTH AVENUE, ST. LOUIS 33, MISSOURI





ONLY 2 GENEVA GEARS

The two Geneva gears operate from a single drive pinion, and are designed for 90° entrance to reduce noise of operation. The reversing switch operates from a cam in the face of the tap selector gear which has a positive mechanical stop to prevent overtravel.

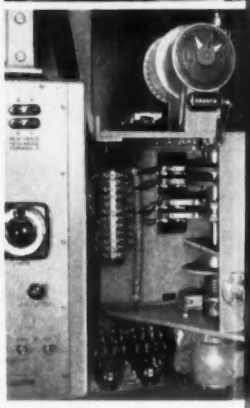


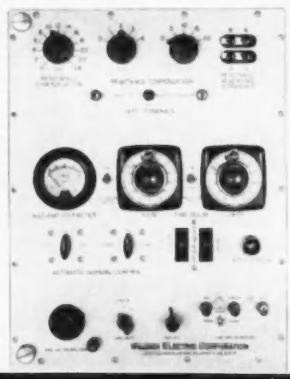
MAXIMUM LIFE CONTACTS

All switch contacts, both moving and stationary, are alloyed copper for maximum resistance to wear . . . reliability proved by life tests far exceeding normal operating conditions. Moving contacts self-aligning . . . free parallelogram action assures maximum contact area with constant pressure.

SINGLE SHAFT DRIVE

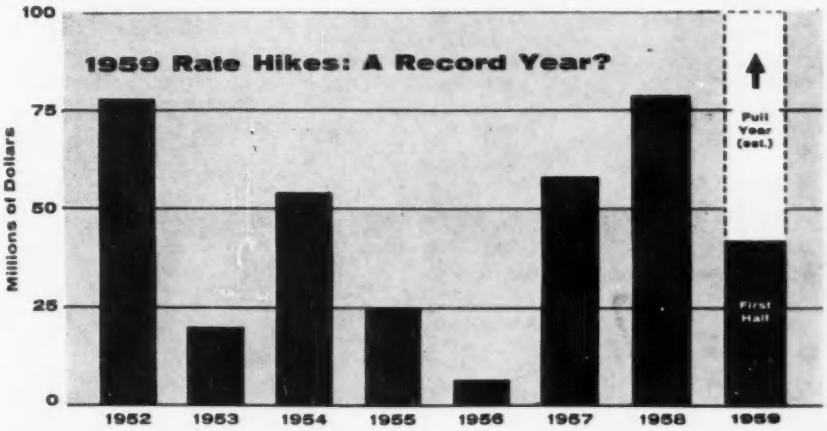
A single main drive shaft, geared to the drive motor and to the drive pinion, operates the tap selector switch and the load transfer switch. This shaft also operates the position locating switches and the position indicator.





MAGNETIC AMPLIFIER CONTROL Magnetic amplifier control eliminates moving contacts in the voltage sensing circuit . . . provides simplified and high accurate band width control.

WT59-14



Rate Hikes Lagging; More Due

Report on
Rates and Regulation

Electric utility rate increases in the first half of 1959 topped $36 million, and the second half opened with close to $65 million more pending action. The first-half total was some $15 million below the comparable period of 1958, but the heavy schedule of applications slated for action in the second half hints at total rate hikes close to $100 million before this year is out.

The reason? Costs are up all along the line. The rapid rise of operating costs, including wages, was cited by many companies applying for increases. Interest rates on Moody's Aa-rated utility bonds have risen by nearly a point in a year—from 3.74% in June 1958 to 4.67% in June 1959. Meanwhile, the Handy-Whitman index of electric light and power construction costs has pushed inexorably upward, in the North Central Division rising from 566 to 600 in two years—an increase of about 6%.

Most courts and commissions have shown their recognition of this problem by granting the utilities rate relief. The first half saw no outright denials of rate increase applications, while hikes were granted to at least 21 companies. Several of the decisions, however, granted the petitioning utilities only a part of the amount requested as a necessary minimum, and the phenomenon known as "regulatory lag" was much in evidence.

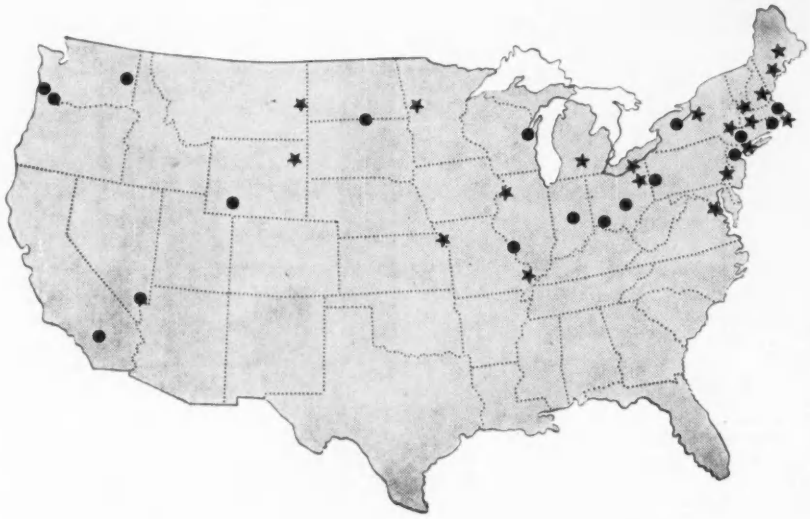
Montana-Dakota Utilities Co is still waiting for a final decision from the North Dakota Supreme Court on a rate increase application first filed in April 1957. The hike was denied by the PSC (EW, Feb. 24, 1958) and this ruling was subsequently upheld by a circuit court. The supreme court is now allowing MDU to collect the increased revenues under bond pending its decision.

Otter Tail Power is also waiting for the outcome of an appeal in North Dakota. The company applied in March 1958 for rates which would have upped revenues by $352,000 a year based on 1957 operations. North Dakota's PSC turned down the petition last September, and the matter now rests with the district court. Otter Tail now has $311,000 out of a proposed $408,000 of increased rates in effect in Minnesota, and plans to file for $94,200 soon in South Dakota in order to secure uniform rates throughout its service area. This would be the company's first general rate increase since 1952.

Here Are Scenes of Rate Action in the First Half of 1959 . . .

★ Increases Granted

● Increases Pending as of June 30



Consumers Power Co came away with less than half the amount it asked for from the Michigan PSC (EW, June 22, 1959, p 58). In an order marked by substitution of net original cost for the fair value rate base proposed by Consumers, the commission granted $6,788,000 of a requested $15,300,000. ECAP advertising expenses were eliminated from the cost of service, as were certain sales and merchandising expenses and some $70,000 in grants for industrial development, scholarships to colleges, and courtesy advertising. Commissioner James H. Lee would have pared the increase further. In his dissenting opinion, he objected to inclusion of normalized taxes and a March 1, 1959 wage increase in the cost of service and inclusion of working capital in the rate base.

As the half ended, Maine's PUC slammed Central Maine Power Co with a ruling that allowed the utility less than 30% of a proposed rate hike. The commission lopped some $11 million off the rate base, adjusted revenues for the test year (1958) upward by $625,000 on the grounds that it was a recession year, and then cut rate of return to 5.75% from the 5.85% asked by Central Maine.

The company will appeal to the Maine Supreme Court. Central Maine Pres W. F. Wyman noted that the decision "to a substantial extent leaves unanswered the financial problem the company is facing," and that it would force the company to "take another look at our program for new construction." He cited the fact that the PUC had thrown out of the rate base many properties whose acquisition it had itself previously approved, and pointed out that "investors have invested in Central Maine with the knowledge of these prior approvals and in that way have provided the funds for these acquisitions."

"It, therefore, becomes most difficult to understand," Wyman went on, "why the commission did not consider such items of property to be entitled to consideration for rate making purposes, and particularly so where some of them represent generating facilities that are actually supplying energy to our customers today. This question and a number of others concerning the commission's decision will be the basis of our appeal to the court."

★ These Hikes Were Granted . . .

	Asked for	Granted
Bangor Hydro-Electric	$465,311	$365,385
Black Hills Power & Light (Wyoming)	46,697	46,697
California Electric Power	39,600	20,681
Consumers Power	15,300,000	6,788,000
Central Hudson Gas & Electric	1,720,000	300,000
Central Maine Power	2,851,000	809,000
Cleveland Electric Illuminating	5,850,000	2,750,000*
Consolidated Edison of New York	10,900,000	8,400,000
Iowa-Illinois Gas & Electric (Iowa)	385,000	83,000
(Illinois)	567,136	269,570
Missouri Utilities	92,421	92,421
Montana-Dakota Utilities (Montana)	300,000	292,852
Niagara Mohawk Power	10,461,000	7,500,000
Northern Berkshire Power	219,000	175,900
Ohio Edison	1,215,000	1,215,000
Otter Tail Power (Minnesota)	408,000	311,000
Philadelphia Electric	1,110,000	1,110,000
Potomac Electric Power (D. C.)	2,937,759	2,937,759
(Maryland)	1,732,573	1,732,573
(Virginia)	148,825	148,825
Public Service of New Hampshire	664,500	503,492
Quincy Electric	171,700	171,700
St. Joseph Light & Power	618,000	618,000
Southern Berkshire Power & Electric	156,567	156,567

. . . And These Are Still Pending ●

Boston Edison	$4,521,000
Cincinnati Gas & Electric	2,773,385
Columbus & Southern Ohio Electric	3,400,000
Consolidated Edison of New York	2,500,000
Indianapolis Power & Light	19,052
Newport Electric	183,000
Orange & Rockland Utilities	450,000
Pacific Power & Light (Oregon)	4,000,000
(Washington)	1,000,000
Pennsylvania Power	1,418,900
Portland General Electric	5,200,000
Public Service Electric & Gas	21,400,000
Puget Sound Power & Light	3,400,000
Rochester Gas & Electric	103,000
Southern Nevada Power	26,100
Southern Wyoming Utilities	36,024
Union Electric	7,893,000
Wisconsin-Michigan Power	1,077,000
Washington Water Power (Idaho)	900,000
(Washington)	2,100,000

Notes: * An additional $3.1 million per year in rate increases will become effective February 1, 1960.
Also, several companies are awaiting court decisions on adverse rate determinations which have been appealed.

At almost the same time, New Hampshire's Supreme Court upheld a PUC ruling which granted Public Service Co of New Hampshire a rate hike of $503,492 a year. Both the state and the utility had appealed the commission's decision. The state claimed that no increase at all was necessary, while Public Service contended that not even the new rates would produce the allowable return and that at least $325,000 more was needed. The court rejected both appeals.

But another utility drew support from Maryland's Court of Appeals, as the court reinstated a $6,039,000 annual rate increase which had been granted to Baltimore Gas & Electric Co by the Public Utilities Commission. Early in 1958 the commission had allowed the hike; but a Baltimore city court struck it down on April 1, 1959, objecting that the rate base had been projected to the end of 1958. This, the city court said, was "unreasonable and unlawful"; and it ordered more than $30 million knocked out of the rate base, and more than $2 million of the increased revenues to be refunded to customers.

The Court of Appeals overturned this adverse ruling late last month, backing the commission's original decision. It called the city court's interpretation of state law "literal, rigid, and completely inelastic," adding that ". . . The meaning and the concept of the words 'used and useful in rendering service to the public' have been held to have a certain elasticity since the phrase first came into use." The Court of Appeals went on: "Conditions in recent years have persuaded regulatory agencies throughout the country to include in the rate base as used and useful in the public service, property estimated to be in service by the end of the test year. The conditions that have prompted this practice are inflation, attrition, and regulatory lag."

The implications of this decision are not limited to Maryland. The appellate court's reaffirmation of the PUC's findings should be of help to utilities in other jurisdictions who have already been accorded forward rate base treatment. The court emphasized in its opinion that the costs to Baltimore Gas & Electric customers have remained virtually unchanged since 1930, "despite the halving of

the purchasing power of the dollar, the trebling of the company's wage rates, and the doubling of its taxes per dollar of revenue."

"Integrated operations" and a "tax clause" were key features of a Missouri ruling which granted St. Joseph Light & Power Co a $618,000 a year rate increase this March. The Missouri Public Service Commission allowed, as part of the increased revenues authorized on electric service, an amount sufficient to cover losses of the company's transportation operation. Since transportation operates only within the city of St. Joseph, this was set up so that the loss would be made up only by customers inside the city, not by those outside the area served by St. Joseph's transportation system. The commission also allowed a provision for rate changes based on adjustments in taxes, similar to the fuel adjustment clause included in many recent decisions.

The Wyoming commission put two interesting points into its January order allowing Black Hills Power & Light Co to increase its rates by $46,697 a year. The commission elected to use system-wide earnings in setting the rate of return (5.66% on depreciated original cost) rather than splitting off the Wyoming property from that in South Dakota, saying that this would benefit customers in Wyoming because of the greater concentration of the company's load in South Dakota. Also, in contesting the increase, one large industrial customer had claimed that the commission could not upset an existing contract between itself and the utility. But the commission ruled otherwise on the grounds that the contract was ". . . unremunerative, unjust, unreasonable, unjustly discriminatory, unduly preferential, and contrary to the welfare of other consumers."

The commission upheld the company's normalization of taxes, citing a previous case where ". . . we held that a utility is entitled to normalize income taxes when using accelerated depreciation for income tax purposes; and that tax deferrals are not a saving to the utility, but a liability." The commission added: "We see no reason why our ruling in the above case should be disturbed at this time."

In stark contrast stands the Maine PUC's order in the Bangor Hydro case, (EW, Feb. 9, 1959, p 78), and two recent actions by the New York PSC involving Niagara Mohawk Power Corp and Central Hudson Gas & Electric Corp (EW, June 8, 1959, p 56; and June 22, 1959, p 58). Maine, by split decision, ordered Bangor Hydro-Electric Co to take liberalized depreciation even though the company had used straight-line depreciation during the test period. The majority said: "We find that the failure of the company to use accelerated depreciation . . . constitutes an abuse of discretion which would place an unfair burden upon its customers." In lonely dissent, Commissioner Frederick N. Allen replied, "For a regulatory body to force this upon Bangor Hydro-Electric Co by mandate, either by direction or indirection, is contrary to the inherent rights of management and beyond the legal scope of this commission."

New York's PSC used a net-original-cost rate base in trimming Niagara-Mohawk's bid to $7.5 million from the $10.5 million requested and in cutting Central Hudson's $1,720,000 request down to $300,000 granted. Only actual taxes were allowed for liberalized depreciation and accelerated amortization in both cases. In the Niagara-Mohawk determination, the commission computed the rate base by monthly averages rather than allowing a year-end rate base.

The New York Commission put off the end of conjunctional billing until Aug. 1, after Mayor Robert F. Wagner and other New York City officials protested its earlier decision to let Consolidated Edison Co start individual billing as of July 1. The PSC also granted Con Ed an $8.4-million-a-year hike in minimum charge, but launched an investigation of the company's rate structure.

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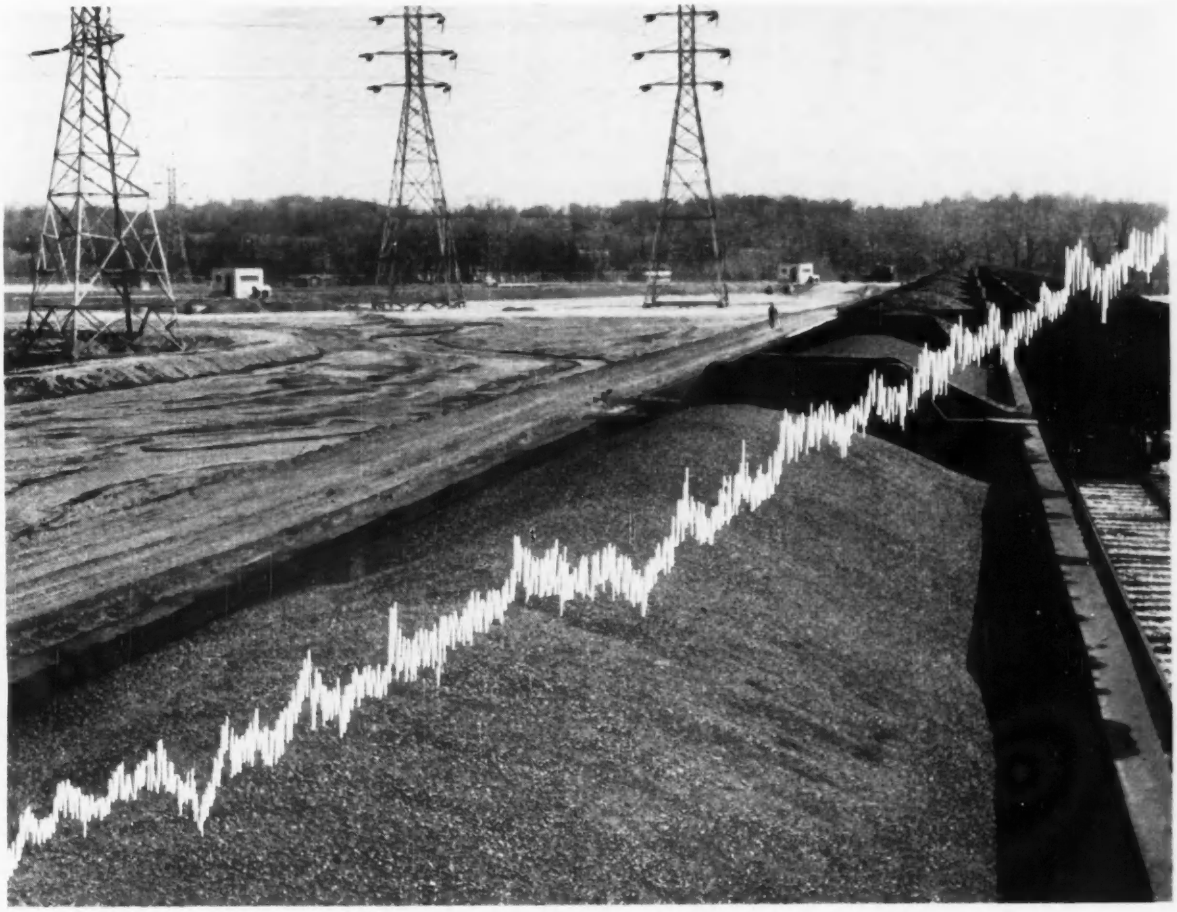
as they project the demand for power in their areas in the decades ahead . . . to know that career coal companies like Island Creek stand ready to deliver all the coal they will need. Island Creek's vast reserves,* modern mining methods and scientific preparation assure continuity of supply far into the future. Our engineers would welcome an opportunity to talk with yours.



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Westinghouse provides bonus value beyond specification.
Shown here are DB-50 power circuit breakers with . . .

1 manual closing

To match your requirements, Westinghouse now offers low-voltage, Type DB power circuit breakers with a choice of manual, electric solenoid, and new spring-manual closing.

The new spring mechanism is simple, sturdy and has been fully tested. It can be used with selective-delayed trips up to the full short-time rating of the breaker and is available on the DB-15, DB-25 and DB-50. Industry standards recommend electric operation on the two largest frame sizes.

Westinghouse Type DB breakers give you ultimate protection and application flexibility for low-voltage power circuits. In addition to your choice of closing mechanisms, they adapt to any mounting —fixed, drawout or separate enclosure. All auxiliaries can be added in the field or at the factory before shipment. You get a selection of multiple tripping characteristics including: standard long delay and instantaneous; selective long delay and short delay; three-element long delay and short delay and instantaneous.

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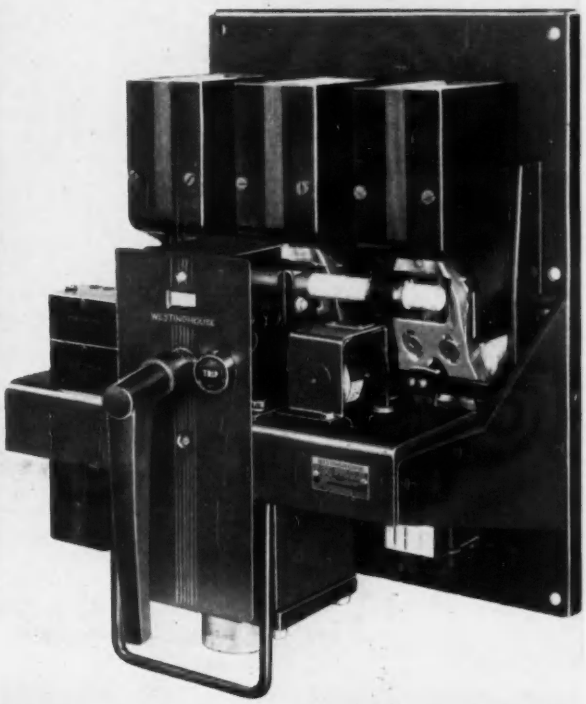
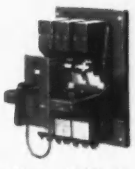


2 spring-manual closing **3** solenoid closing

You choose... the protection you need



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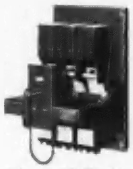

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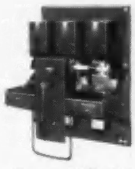

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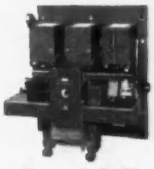

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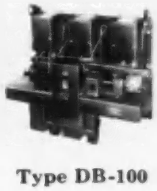


Type DB-100

You select... the type of operation you want

Conventional Manual Closing		Quick-Make Spring-Manual Closing		Electric Solenoid Closing	
For Fixed Position Mtg.	For 3-Pos. Drawout Mtg.	For Fixed Position Mtg.	For 3-Pos. Drawout Mtg.	For Fixed Position Mtg.	For 3-Pos. Drawout Mtg.

Johnson Named President of Hawaiian Electric

Ralph B. Johnson has been named president of Hawaiian Electric Co. He succeeds Leslie A. Hicks, who retired July 1.

Johnson graduated from Massachusetts Institute of Technology in 1927 with a degree in chemical engineering. After nine years in the sugar industry, he joined Hawaiian Electric in 1936.

He moved up through the executive ranks to administrative vice president, and then two years ago to executive vice president.

Other business connections include president of Molokai Electric Co, vice president of Molokai Ranch Co, and a director of the Bank of Hawaii, Cooke Trust Co, and Oahu Railway & Land Company.

Hicks, who is retiring after 40 years with the utility, will continue as a director and become a chairman of a new finance committee of the board.

Davis Made Division Vice President at Georgia Power

Temp S. Davis, Jr, has been named to succeed Edwin M. Clapp as vice president in charge of the Columbus division of the Georgia Power Co. The appointment becomes effective with Clapp's retirement on September 1.

Before joining the utility as a lighting engineer in 1934, Davis was a sales engineer with General Electric Co.

He was named sales supervisor of the Augusta division in 1935 and two years later to the same capacity in Rome. In 1951 Davis was made manager of the community development division in Atlanta and in 1955 sales promotion manager. Since 1957 he has been assistant manager of the Atlanta Division.

A graduate of Tifton A & M he received a BS in electrical engineering from Alabama Polytechnic Institute.

Tucson Utility Promotes Clawson to Vice President

C. L. Clawson has been promoted to vice president and treasurer of Tucson Gas, Electric Light & Power Co. He will also serve as assistant secretary. He has been a director and secretary-treasurer since 1940.

Clawson first entered the utility field in 1920 with Springfield Gas & Electric Co and Springfield Traction Co. He served as chief clerk of the accounting department of Federal Light & Traction Co, the holding company for the Springfield properties, until he was transferred to the Tucson properties of Federal Light & Traction in 1936.

P. L. Abbott has been named secretary and assistant treasurer, and W. D. Brooks has been made assistant treasurer of the Tucson utility.

(*More News About People on p* 90)

IFETIME SERVICE BACKS UP OCOTILLO'S EW LJUNGSTROMS®

Extremely compact and highly efficient, these baskets of heat transfer surfaces are the heart of the Ljungstrom. (The photo below shows one being lifted into position.) Every inch of these baskets is the approximate equivalent of one foot of a standard tubular heat exchanger. The combined surface of the Ocotillo Air Preheaters provides 263,600 sq ft of heating surface.

The new Ocotillo Power Plant, near Tempe, Ariz., employs four Ljungstrom Air Preheaters for its two 835,000 lbs/hr boilers. Dependability is built into these Ljungstroms, from their corrosion-resistance to their double-life reversible elements (shown in the photo above).

But one of the most important reasons why Ocotillo chose Ljungstrom is Lifetime Air Preheater Service. Throughout the life of each unit (units dating from 1923 are still in operation), Air Preheater engineers make regular calls to inspect the units and keep them in top operating condition.

What's more, Air Preheater provides rapid factory service, too. Here's an example: a customer called on a Friday morning requesting immediate shipment of cold-end seals for an Air Preheater. But regular fabrication time would take until the weekend, when no ordinary transportation would be available.

So Air Preheater went to work. Special trucking was arranged. And by a tremendous effort, fabrication was completed *on the same day the order was received* . . . and the customer received the necessary parts *only ten hours after his initial request.*

Fast response to emergencies and regular inspection throughout the life of each Ljungstrom installation are two of the many advantages Air Preheater provides its customers. Another is expert knowledge of boiler and preheater problems—and how to lick them—gained from over 35 years' experience. Perhaps these reasons explain why nine out of ten preheaters sold today are Ljungstroms.

THE AIR PREHEATER CORPORATION

60 East 42nd Street, New York 17, N. Y.

Good fabrication and welding properties of "T-1" Steel saved time and money in the shop and on location. Owner: The Washington Water Power Company. Engineering: Ebasco Services, Inc. Scroll cases: Chicago Bridge & Iron Co. Turbines: Allis-Chalmers Co. General contractor: Morrison-Knudsen Co.

"T-1" Steel cuts weight of big turbine scroll cases 50%

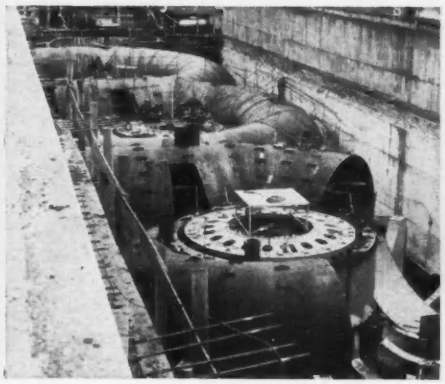
A SCROLL CASE looks like a giant sea shell. Water gushes into it from a high level reservoir. Through the conch, the water swirls in an ever-tightening spiral into the blades of water turbines. Because the cross section of the spiral passage diminishes, the water pressure and velocities are built up for efficient power generation. Four of these scroll cases, among the largest in the United States, have been built from USS "T-1" Steel by the Chicago Bridge & Iron Company. They are installed in the Noxon Rapids Dam, an $87 million project now under construction by the Washington Water Power Company to harness the waters of Clark Fork River. The dam is located on the site of a prehistoric lake in western Montana.

Because of the fierce pressure and erosive action of the water, it was obvious that a very strong, abrasion-resisting steel was required. USS "T-1" Constructional Alloy Steel not only met these requirements, but permitted a reduction of about 50% in plate thickness.

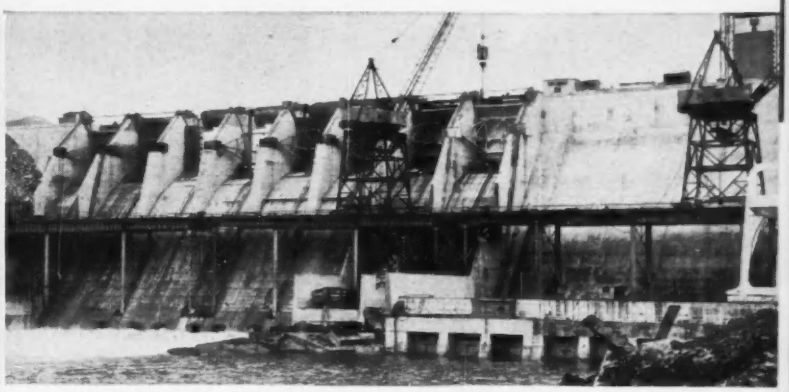
COST SAVINGS. By using USS "T-1" Steel, there was substantially less weight of material to ship across the country. Weld time and weld metal were reduced. Foundations could be made smaller.

This job points up the economies possible with the use of USS "T-1" Steel: lighter weight, greater strength, weldability and resistance to impact abrasion. Write for our "T-1" Steel book containing complete information. United States Steel, Room 2801, 525 William Penn Place, Pittsburgh 30, Pa.

USS and "T-1" are registered trademarks



Scroll cases built with USS "T-1" Steel to obtain maximum strength with the least weight. Largest diameter is 24 feet with a speed ring about 28 feet in diameter.



Noxon Rapids Dam a new $87,000,000 power project by the Washington Water Power Company to harness the waters of Clark Fork River in western Montana.

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Tennessee Coal & Iron – Fairfield, Alabama
United States Steel Supply – Steel Service Centers
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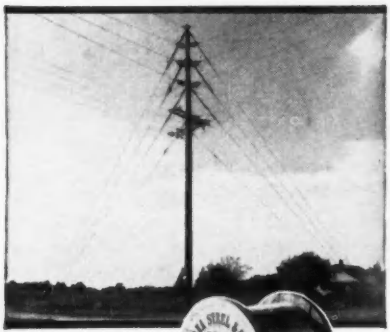

Write for booklet OG-25 containing "Sag and Tension Data for Overhead Ground Wire."

INDIANA

STEEL & WIRE CO., INC., Muncie, Indiana

Hamrick Joins Reddy Kilowatt Staff

John E. Hamrick joins Reddy Kilowatt as assistant to the president on July 13. He has been with Edison Electric Institute for the past 2½ years on the Housepower and NELP projects.

Prior to joining EEI, he was in sales work with Bridgeport Brass Co, and was executive assistant with F. A. Bartlett Tree Expert Co.

Hamrick replaces Everett Easter who will join "Living For Young Homemakers" magazine as promotion director.

Garrett Named Publisher and Editor of EL&P

P. B. (Jack) Garrett has been named publisher and editor of Electric Light & Power magazine. He has also been made a vice president and member of the board of directors of Haywood Publishing Co.

Garrett had been editor-in-chief

(*Continued on page* 94)

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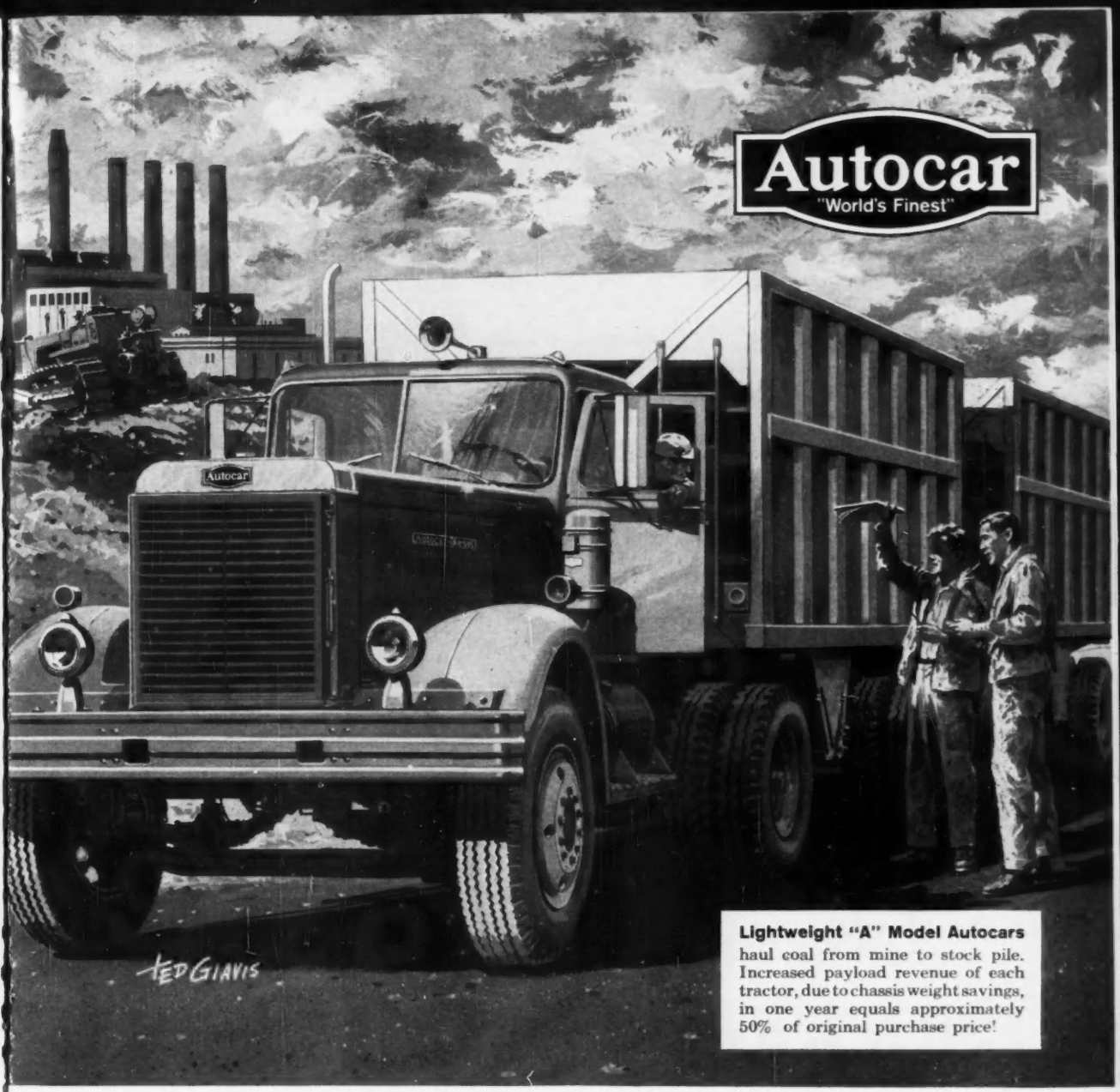

Lightweight "A" Model Autocars haul coal from mine to stock pile. Increased payload revenue of each tractor, due to chassis weight savings, in one year equals approximately 50% of original purchase price!

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Autocars are tops in their class by *any* comparison. Don't settle for less than Autocar comfort, safety, reliability, performance and service. Don't settle for less than the "World's Finest" in heavy-duty trucks.

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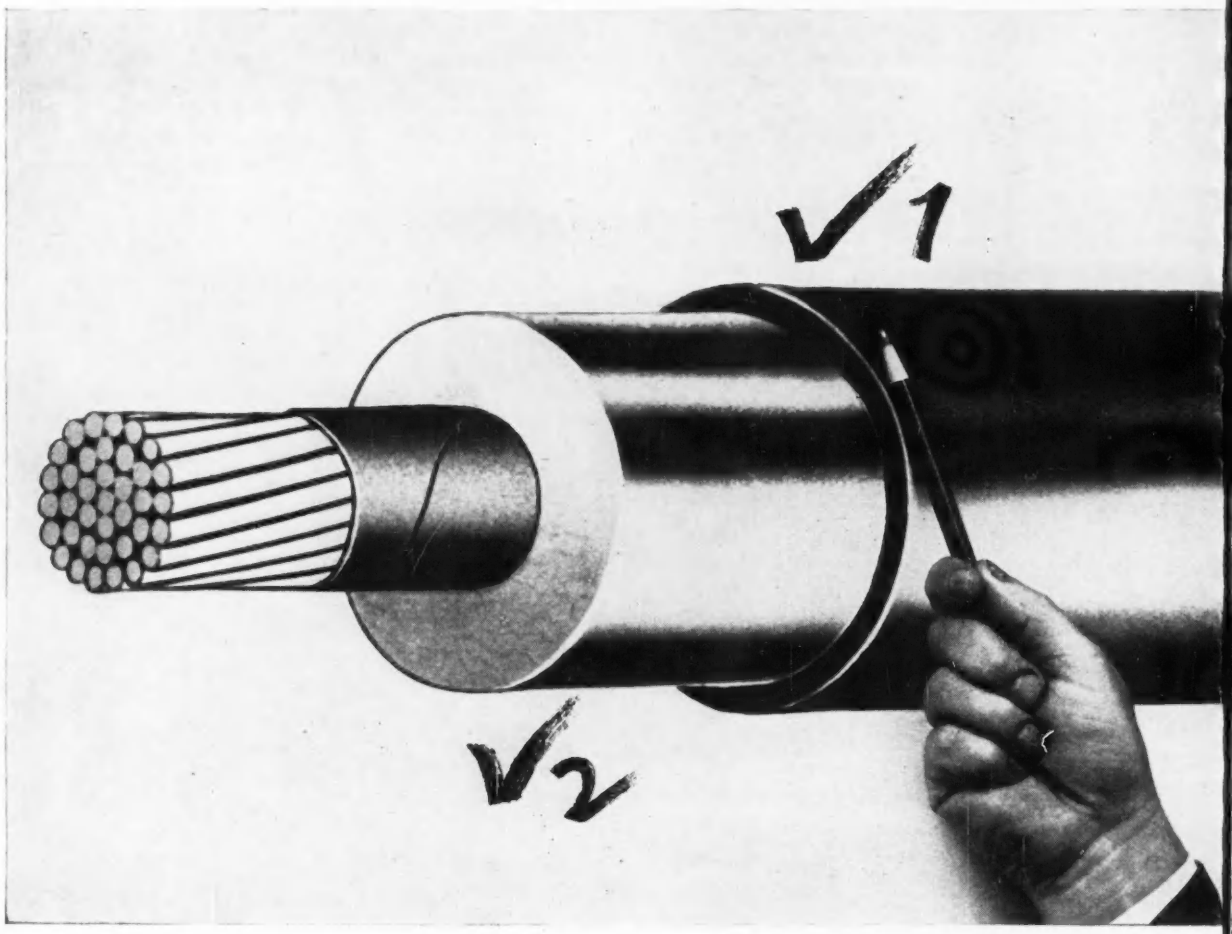
Division of
The White Motor Company
Exton, Pa.



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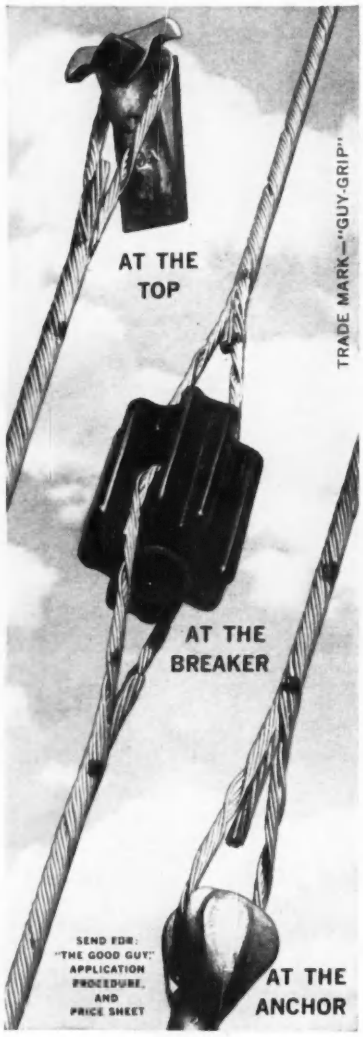

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of EL&P since 1945. Before that he was with Westinghouse Electric Corp.

He is a Fellow in the American Institute of Electrical Engineers and a member of Eta Kappa Nu.

PERSONAL BRIEFS

Connecticut Light & Power Co has appointed **Warren A. Greten** as assistant plant superintendent at Devon—and **H. Read Shailer, Jr.,** has been promoted to division sales engineer for the Northern Division. **Carl R. Larson** has been promoted to the newly created position of Berlin building manager.

William W. Talbott has been made executive assistant in Montana Power Co's general office in Butte. **John W. Cromer** will succeed Talbott as manager of the Bozeman-Livingston Division.

William E. McQuillen has been named manager of market research of Exide Industrial Division of The Electric Storage Battery Co. **O. L. Robertson** has been named motive power market manager in the division.

Line Material Industries has promoted **Ralph H. Earle** to manager of engineering development; **Robert P. Thompson** to manager of central engineering and research; and **Robert A. Hinshaw** to manager of engineering-transformers.

Charles A. Berlepsch, director of purchases for Rockbestos Products Corp, retired June 30 after 41 years with the company.

I-T-E Circuit Breaker Co has appointed **Joseph P. Wood** to the newly created position of power equipment consultant, and **John P. Bennett** to manager of marketing research.

Keasbey & Mattison has named **Lawrence J. Clark** systems and procedures manager, and **Lee Z. Wilkins** sales service manager.

Reynolds Metals Co has added **William H. Anderson,** electrical conductor specialist, to its industrial market staff in Houston, Tex.

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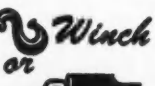

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UT&BCo.

"By installing BERMICO CONDUIT at breakneck speed, we kept project work moving on schedule"

WILLIAM McCABE, Vice-President
Lord Electric Co., Portland, Oregon

Under construction. Lloyd Center, Portland, Oregon, one of the nation's largest metropolitan business-shopping developments, costing an estimated $30,000,000. 20,000 KVA initial power requirement.

"PRIME CONTRACTS for the Lloyd Center were let four months before the electrical contract," pointed out Mr. McCabe, Vice-President and Manager of the Portland office of Lord Electric Co. "By the time we were awarded our contract — the site was ready for the electrical conduit, so we had to move fast.

"Fortunate for us, Bermico was specified. By installing Bermico Conduit at breakneck speed, we kept project work moving on schedule."

Bermico Conduit is a great boon to electrical engineers, contractors and utilities. It is lightweight, easy to handle, simple to cut and assemble. Each 8-foot length is precision engineered, with smooth inside bore to allow easy pull-through without abrasion. Bermico is made from cellulose fibre, impregnated with coal tar pitch. It is extremely resistant to acids, alkalies, heat, water and corrosion — and of high dielectric strength. Use Bermico on *your* next job.

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1. Available ratios—2/1, 2.4/1, 4/1 and 5/1 in either 600-volt class (10 kv BIL) or 1200-volt class (30 kv BIL)
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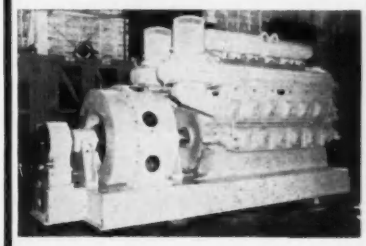

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Readers Forum

That Decimal Point, Again

To the Editor:

On page 67 of your May 18, 1959 issue, you credit me with a statement that should qualify me for your "Electrical Dreamers Club."

Unfortunately, however, the setup cost of applying punched cards to our transformer load monitoring program is not $80, as reported, but $80,000.

Tom Hoke
Senior Engineer
Oklahoma Gas and Electric Co
321 North Harvey
Oklahoma City 1, Oklahoma

"It Seems a Pity . . ."

To the Editor:

"Electrical World" has taken out of context and mis-stated part of my editorial appearing in the April 1959 issue of "Distribution" magazine. I refer to the Executive Reader of your June 8, 1959 issue where it says, "If the utilities prefer 240/416—v, 3-phase over 240/480 v, single-phase, then the industry will end up with two higher voltage 3-phase standards, because industrial customers prefer 265/460—v, 3-phase. Let's face it and give both 3-phase standards equal status."

Nowhere in the editorial did I say anything about utilities preferring 240/416Y—v, 3-phase over 240/480—v single-phase.

Your magazine statement, "Let's face it and give both 3-phase standards equal status" also implies a recommendation that industry should adopt 240/416Y—v in addition to the 265/460Y—v now in use. If you will refer to the attached editorial you will see that many reasons are given for not adopting 240/416Y—v. However, if comments from EEI members who are now reviewing the preliminary report of the EEI-NEMA Joint Committee indicate that they prefer 240/416Y—v, then both voltages will be used in the industry and they should have equal status.

"Electrical World" could probably have performed a better service for executives if they had used the following quotation from my editorial: "It seems a pity that two voltages within 11% of each other should become established in the industry."

H. E. Campbell-Senior Engineer
Power Distribution Engineering
ELECTRIC UTILITY ENGINEERING
General Electric Company
Apparatus Sales Division

Adequate Wiring for Utilities

To the Editor:

An editorial in the May 18, 1959, issue of *Electrical World* invited comments on remarks concerning the inadequate wiring program.

It seems to me that the writer sets forth, in an effective manner, some apparent inadequacies of the wiring promotion which may well retard, instead of increase, the use of electricity.

It might be wise for the suppliers, who habitually serve ten to fifty customers with 100 ampere secondary or smaller service drops, to examine the adequacies of their own wiring before they encourage the enactment of laws demanding their customers put in 100 ampere service to their homes.

Elementary arithmetic clearly shows that voltage drop in 300 feet of #2 secondary is 10 times the drop in 30 feet of #2 service. I have seen instances where the customers, after spending heavily for larger service, speedily came to the conclusion that inadequate voltage was not eliminated.

If fire hazards due to electrical wiring exist, undoubtedly the insurance companies affected will refuse to insure and will increase their rates if need be.

Name Withheld

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Ocean-bed Bonanza!

Seven miles off the coast of Louisiana, Freeport Sulphur Company is preparing to tap a rich, new sulphur deposit — under 50 feet of water!

The base of mining operations, pictured above while under construction, consists of a Y-shaped island stretching for nearly one mile and towering more than 60 feet above the water.

Five large and ten smaller steel pile towers, connected by 200-foot-long bridge spans, support the complex facilities whereby sulphur is melted in its underwater formation by superheated water, and then brought to the surface in molten form.

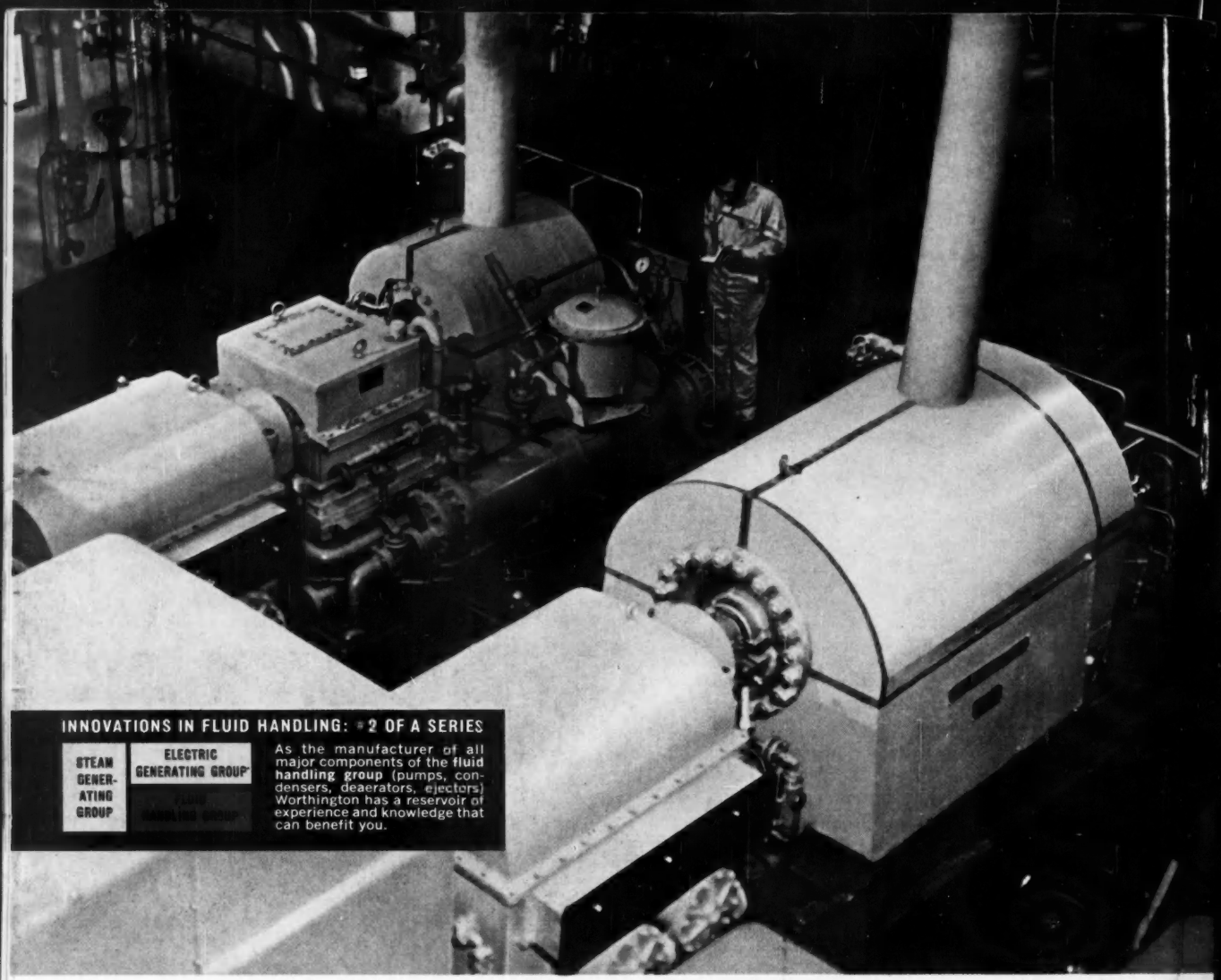
The vital power for this operation pours from huge generators to the drilling platforms through Simplex submarine power cables. Simplex, a working partner of the mining industry for thirty years, is proud to participate in this monumental engineering achievement.

Simplex

LIVE BETTER ELECTRICALLY

WIRE & CABLE COMPANY

79 Sidney Street, Cambridge 39, Mass.


INNOVATIONS IN FLUID HANDLING: #2 OF A SERIES
STEAM GENERATING GROUP
ELECTRIC GENERATING GROUP
As the manufacturer of all major components of the fluid handling group (pumps, condensers, deaerators, ejectors) Worthington has a reservoir of experience and knowledge that can benefit you.

This photo measures pump progress. Here are two boiler feed pumps with duplicate pressure and capacity ratings. On the right is a unit of conventional speed; the other is the fastest pump of its type in service, running at 9,000 rpm. Smaller size is dramatically evident.

PUMP PARADOX

High speed boiler feed pumps are several times as fast, yet actually more reliable

In modern power plants, the demand for higher efficiency has led to higher operating pressures and, therefore, higher heads for boiler feed pumps. This is a critical area for the fluid handling group. Can you obtain these higher heads without sacrificing reliability?

Worthington has proved that you can. By going to speeds twice as fast (and even greater) Worthington drastically reduces shaft spans required. This cuts shaft deflection to a fraction of its former value. Since pump wear, and hence pump life, is directly related to shaft deflection, the high speed pump is actually more reliable than a conventional unit of the same capacity.

Experience in the field has proved the wisdom of Worthington's design philosophy. More than 39 Worthington high speed pumps are now installed and 21 are on order. Speeds range from 6,500 to 9,000 rpm. If necessary, Worthington sees no reason why speeds shouldn't go even higher, without departing from experience-proved construction principles.

Reducing shaft deflection through shorter shaft span is only one way that Worthington increases boiler feed pump reliability. Other ways include larger shaft diameters, liberal clearances, shrunk on impellers, metal-to-metal pressure joints, a special method for measuring internal wear, and anti-oil-whip bearings.

High speed boiler feed pumps are one example of Worthington's leadership in the fluid handling area. Through the years Worthington has made many contributions to the solution of power plant problems. Why not put this progressive "know how" to work on your next plant? Worthington Corp., Harrison, N. J. In Canada: Worthington (Canada) Ltd., Brantford, Ontario.

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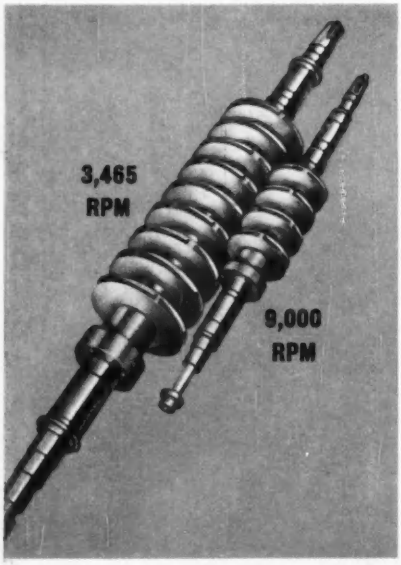

Comparison of rotors. The rotors used in the two pumps above are shown here. The 4-stage rotor used in the high speed pump will have one-third the deflection of the 9-stage rotor in the conventional unit.

WORTHINGTON